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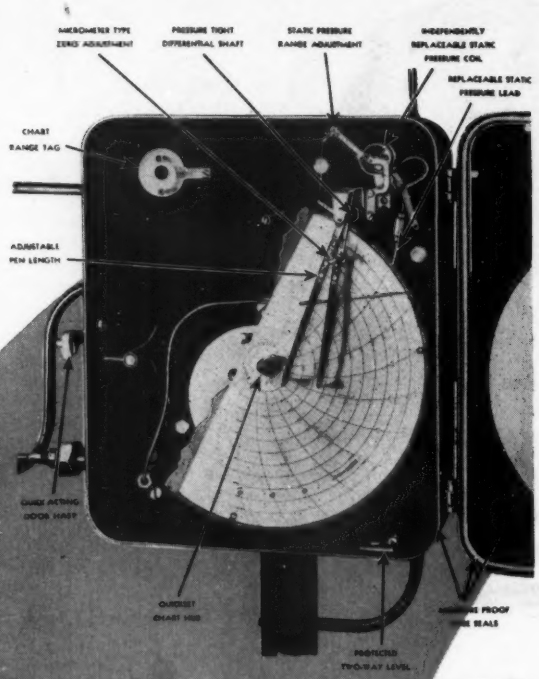

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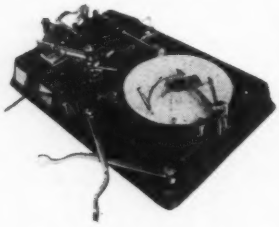

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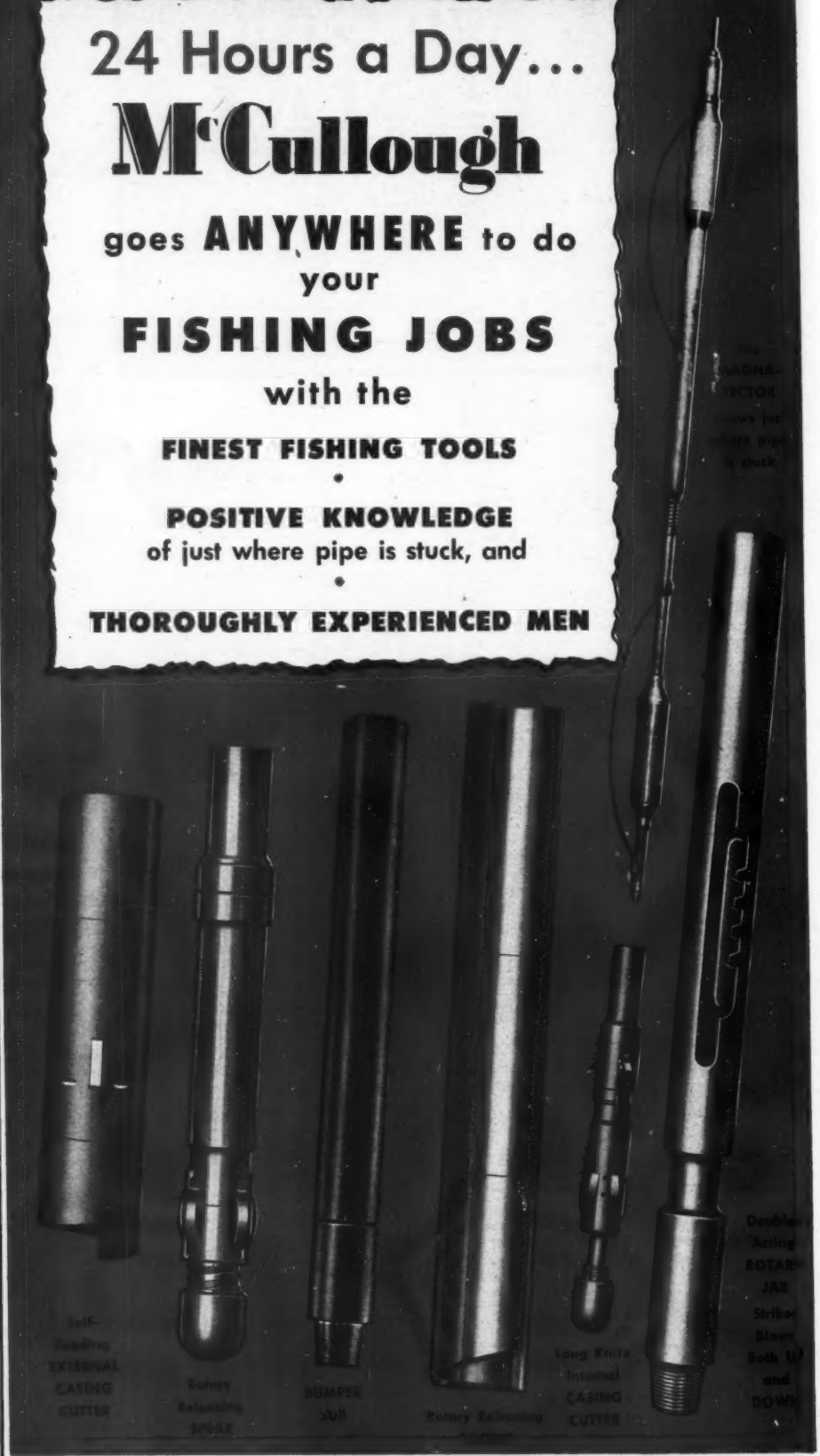

THE OIL AND GAS JOURNAL

"Cutting Off the Nose"

THERE probably is no better example of the present confused international thinking, 28 months after the close of the world's most destructive war, than the threat of some Arab countries to stop petroleum expansion in the Middle East. The proposal is a protest against U.N. action in authorizing the partition of Palestine.

It is not charged that the American, British, and French oil operators are in any way involved in the issues at stake in the U.N. action. It is admitted that the operators concerned have been fair in their relations with all peoples and have not become involved in political matters.

The objectives of the Middle East operators are explained as part of this Annual International Number and the statistical reports summarize the accomplishments to date. Concession owners over the past decade have added greatly to the initial oil discoveries of 40 years ago and now Middle East proven oil reserves are greater than those of any other region.

The time has arrived for a more rapid expansion of Middle East oil resources which lie within the strategic center of the Eastern Hemisphere. The existing oil markets of the producing countries are minor, but to the west are demands upon which the rehabilitation of Europe depends. Efficient operation necessitates the laying of big-inch pipe lines connecting the fields along the Persian Gulf to the Eastern Mediterranean. The operating companies are prepared to spend literally hundreds of millions of dollars in laying these lines and in the construction of refineries.

The Arab peoples will be the principal beneficiaries of this program. Concession and royalty payments and taxes will provide governments with funds with which to carry out educational programs, irrigation and power projects, and the development of other natural resources. Without these there can be no economic recovery in an area where the great mass of the people live a marginal existence.

Of immediate importance is the fact that tens of thousands of Iranians, Iraqis, Arabs, Egyptians, and the nationals of other countries are being taught the know-how of oil operations. These operating activities are supported by housing, food, health services, working conditions, and schooling not found in any other part of the Middle East.

The peoples of the Middle East for the first time in many centuries have the opportunity to emerge from economic darkness and resume a place in world leadership to which they are entitled by their cultural attainments and their geographical location. If they insist on a retaliation program with oil operators the victims, it would seem that they are open to a charge of a short-sighted policy best summarized in the American expression of "cutting off the nose to spite the face."

Congress Suspends Oil Studies But Many Control Proposals Await Next Session

by Bertram F. Linz

WASHINGTON.—With a good start made on European relief and anti-inflation legislation, Congress folded up the special session December 19 and went home for a 2-week rest.

As they prepared to adjourn until January 6, the congressmen put the finishing touches on interim aid for France, Italy, and Austria and sent to the White House a bill modeled on 4 of the 10 antiinflation proposals made by President Truman but without any of the authority he asked for the control of industry.

The high spot of the bill was a provision permitting voluntary industry agreements to divide up the supplies of scarce commodities, with protection against prosecution under the anti-trust laws. Also included, however, were extensions of the present controls on exports and transportation.

Adjournment came at the end of a week in which there were these developments in the petroleum picture:

Senator Tobey's industry committee reported on the steps that could be taken to minimize the fuel oil shortage in the New England and Atlantic Coast states, the most important being the appointment by governors of emergency fuel coordinators to work with suppliers to secure equitable distribution and the relief of hardship cases.

The House interstate commerce committee, following Tobey's example, held a 2-day "round table" with industry representatives and government experts, also to the end of mapping out a plan for quick relief.

The Senate small business committee issued a report on its recent investigation, also outlining some steps to alleviate conditions.

Rep. George G. Sadowski of Michigan called for a 2-week suspension of all oil exports to increase domestic supplies.

The House public lands committee approved a resolution calling on the secretary of the interior for information concerning the amount of fuel oil and gasoline available in the United States and what steps the Government should take to make the proper and necessary supply available.

Industry Proposals

All of the programs submitted to the congressional committees to deal with the current situation stressed the same points: consumer cooperation in reducing fuel consumption; adjustment of refinery yields to maximize distillate output; operation of all available tankers and tank cars. In the case of the industry groups reporting to the interstate commerce committees it also was suggested that the Government limit its oil requirements for the first quarter of 1948 to minimum operating needs and defer until later in the year any attempt to attain any desired stock level; that exports be kept to a minimum during the next 2 or 3 months, and that crude production be stepped up over the next few months.

In its report to Tobey, who heads a special subcommittee of the Senate interstate commerce committee, the industry group foresaw a shortage of 15 per cent in distillate supplies for New England and the Atlantic seaboard during the period from this month through March, but expressed the opinion this deficit could be wiped out if all the steps outlined are taken.

However, it said, an expected deficit of 10 per cent in heavy residual fuel will be more difficult to make up, although it is hoped that at least some progress can be made in this direction.

Submitting the report to the Senate December 18, Tobey declared he proposed to keep in close touch with the situation. He expressed confidence that real results could be achieved by the voluntary program, which he said will require no relaxation of the anti-trust laws, but added that if it does not work "the obvious alternative is something drastic in the way of controls, and God permit that we may keep away from such things in this country."

Tank Cars Short

The round-table sessions of the House interstate commerce committee, held behind closed doors, followed further hearings at which ODT officials denied there was any shortage of tank cars in New England and Sadowski proposed his 2-week export holiday.

Arthur Gass, head of ODT railway transport, cited cases of refineries in the Boston area which had been holding empty tank cars for a year or more, but admitted that more cars were badly needed in some interior areas which are more dependent on land transportation.

Gass submitted figures showing that there are 8,816 fewer general purpose tank cars now than on January 1, 1945. Only 705 new general purpose cars were manufactured during the first 10 months of 1947, and while schedules of production from December 1 to March 31, next, call for 2,044 new cars of all types, their actual manufacture depends upon the flow of steel. At least 7,000 new cars could be absorbed merely as replacements for cars now wearing out, he said. The great emphasis now is on securing cars to carry crude from West Texas producing points to East Texas refineries, he told the committee.

Export Ban Talked

Sadowski's proposal for a ban on exports was based on a charge that oil companies are sending their product to the most profitable market without concern for the needs of domestic consumers. He proposes that it run for 2 weeks, during which no fuel oil or gasoline would be allowed to leave the country. If the results of the embargo would not reflect in an increase in domestic supplies, he would have it extended for successive 2-week periods.

Commerce Department officials immediately responded with a warning that an embargo might do more harm than good.

Thomas C. Blaisdell, head of the Office of International Trade, said exports to Canada have been reduced from 9,000,000 to 3,000,000 bbl. monthly and may be cut further, and contended that the embargo might result in the diversion to areas which depend on the United States of imports which otherwise would come to this country, leaving us no better off, and that the entire trade situation might be so disrupted that we would lose more, in terms of other vital products, than would be gained in oil.

Big Companies Criticized

Reporting on his investigation as chairman of a small business subcommittee, Sen. Kenneth S. Wherry of Nebraska charged there is no open market for crude oil such as exists in other commodities, and that their control over crude pipe lines enables the major companies to control crude at the source.

Wherry disclosed that he has asked the Federal Trade Commission to investigate the legality of the "phantom" freight which he alleged is

charged by the majors owning products pipe lines.

Citing charges by distributor witnesses that there is a definite plan on the part of the major integrated companies to eliminate the independents in all branches of the business, Wherry declared the continued concentration of the control of the oil industry in the hands of a few companies presents a real challenge to American ideas of free enterprise and the preservation of small business."

His recommendations were largely the same as those of the industry, calling for consumer cooperation, full use of tankers and tank cars, and equitable distribution of supplies. He also suggested the possibility of establishing "refining in transit" rail rates to reduce the cost of transporting oil from distant crude fields to refiners lacking nearby sources, and called for the establishment of "open markets" for crude and products in such manner that "no segment of the independent industry be discriminated against."

In passing its antiinflation bill, the Republican leadership undid the mistake it made earlier when it sought to jam the three-point Wolcott bill through the House under a gag rule requiring a two-thirds vote and was soundly beaten. Taking a bill sponsored in the Senate by Sen. Robert A. Taft of Ohio, the leadership called for a modified gag rule which required only a majority vote, easily secured.

Because the bill was closely in line with the president's recommendations, the Democrats made no effort to defeat it, although they sought unsuccessfully to load it with amendments.

It provides that voluntary industry programs may be submitted to the attorney general for clearance, and if given approval whole industries may participate without fear of antitrust prosecutions, but any agreements made must steer clear of any effort at price fixing.

Europe May Get 75,000,000 Bbl. Less Oil Than Originally Called for by CEEC

WASHINGTON. — Actual provision of dollar oil to the 16 western European nations to be aided under the Marshall plan may be as much as 75,000,000 bbl. less than originally called for in the report of the Committee for European Economic Cooperation.

This was indicated in supporting material sent to Congress last week with President Truman's message calling for legislation to get the program under way.

In assigning its "home work" to the departing Congress, the President gave it the draft of the bill he desires, setting up an Economic Cooperation Administration to take direction of the program, which calls for the authorization of $17,000,000,000, of which $6,800,000,000 would be required for the first 15 months, from April 1, next, through June 30, 1949.

The actual work of the program would be largely in existing departments and agencies. Government representatives would be sent into each of the aided countries to see that there are no abuses, and each country would be required to conclude an agreement with the United States, setting forth certain requirements, such as the promotion of its own production so as to become independent of abnormal outside economic assistance, the establishment of a stable monetary system, and the cooperation with other countries to reduce barriers to trade and make efficient use of all resources.

While the program is primarily directed at 16 countries, the requirements for the receiving of aid are so written as to leave the door open for others, apparently an invitation to the eastern European countries now under the domination of Russia.

The material sent to the Capitol with the message, outlining and explaining the proposed legislation, indicated that 107,915,000 metric tons of petroleum, costing $2,305,600,000 on the basis of July 1 prices, is to be provided. The CEEC report called for 118,450,000 tons, to cost $2,460,847,000 on the basis of last July's prices.

For the first 15 months of the program 29,274,000 tons, costing $681,900,000, will be required, but only 20 to 30 per cent of this is to be supplied from the United States, the remainder coming from American companies operating in the Caribbean, Middle East, and other areas.

A discussion of the projected energy consumption of the aided countries disclosed a planned substitution of petroleum and hydroelectric power for coal as sources of energy in the early part of the recovery period, although even at the end of the program coal will account for approximately three-quarters of total energy production, but indicated also this is not expected to be accomplished.

It was brought out that the CEEC report envisioned a rapid expansion on the consumption of petroleum products to a 1951 level more than double that of 1938.

"The participating countries intend to expand refining capacity in Europe by 150 per cent," it was explained. "However, the availability of oil, transportation, and refining facilities will probably be insufficient to permit European consumption at the rates proposed by the CEEC. The participating countries are not expected to reach their 1949 goal until 1951-52.

It was explained that the executive branch estimates of petroleum imports by the participating countries are below the requirements submitted by the CEEC "because the large increase in demand since the war has resulted in a temporary world-wide shortage."

"The estimates call for a large and increasing proportion of imports to be supplied by the participating countries themselves, largely through their companies operating in the Middle East. The remainder will be supplied by United States oil companies, chiefly from Caribbean and Middle Eastern fields, with the proportion of Middle Eastern oil increasing as production in that area expands in later years of the program.

No Drain on Reserves

"On a tonnage basis imports from the continental United States are small relative to total imports of dollar oil. Since petroleum imports of the continental United States are now approximately equal to exports, the petroleum refining industry in the United States is in effect processing and exporting only imported petroleum. Consequently exports to the participating countries do not constitute a drain on domestic petroleum reserves. Interruption of this movement would disturb trade patterns and result in inefficient use of refining capacity."

It was commented that no detailed estimates are available on the petroleum-equipment import requirements of the European countries, a lack which has caused considerable concern to domestic operators.

The CEEC estimates provided only for the equipment needs of their national companies operating in the participating countries, their dependent areas, and in third countries, but made no allowance for the needs of American companies in the participating countries or in their colonial dependencies, and so far it has not been possible to obtain adequate information from American companies on their requirements in those areas.

"Preliminary estimates indicate that the petroleum-equipment requirements of the participating countries, including allowances for equipment needed by United States companies within the participating countries and their dependencies, may run as high as $1,500,000,000, as compared with the CEEC figure of $588,000,000, it was stated. "It is unlikely, however, that availabilities will permit an export of this magnitude. Exports for the four years are more likely to be in the range of $850,000,000 to $950,000,000."

Acquired Lands Lease Regulations Issued by Federal Bureau

WASHINGTON. — New regulations relating to oil and gas leases in tracts of land acquired by the federal Government were issued December 22 by the Bureau of Land Management.

The regulations are based on the Mineral Leasing Act for Acquired Lands passed at last session of Congress to permit leasing of such lands, which were not covered by the mineral leasing law. No estimate has been made of the total amount of land affected by the regulation since no consolidated inventory of land acquired by the various federal agencies has been made, but it is estimated that, together with certain lands transferred from the Department of Agriculture, more than 40,000,000 acres are involved. The bureau reported that there are now 196 oil and gas leases and 94 other permits embracing 268,000 acres, with 597 applications pending which cover more than 1,000,000 acres.

The new act covers all acquired lands other than those (1) acquired by the Government for development of their mineral deposits, (2) by foreclosure or otherwise for resale, (3) reported as surplus under the Surplus Property Act, (4) in incorporated cities, towns, and villages, (5) in national parks and monuments, (6) set apart for military or naval purposes, including lands within naval petroleum and oil shale reserves, or (7) tidelands or submerged coastal lands within the Continental Shelf.

Following are the highlights of the new regulations:

Leases or permits may be issued only with the consent of the head of the department or agency having jurisdiction over the lands and subject to such conditions as he may prescribe to insure adequate utilization of the land for the primary purpose for which it was acquired or is being administered.

Leases and permits heretofore issued by the Agriculture Department will continue to be administered under the regulations under which they were issued, but applications pending at the time the act was passed will be considered as subject to its provisions and will be processed by the Bureau of Land Management instead of the agency with which originally filed.

Each application for lease or permit must contain a complete and accurate description of the lands desired, and a statement showing the applicant's interest, direct and indirect, in leases or permits for similar mineral deposits, or in applications therefor, on federally owned acquired lands in the same state.

Leases outstanding August 7, 1947, covering lands subject to the new act may be exchanged for new leases to be issued under the act, which will run for a term of 5 years and so long thereafter as oil and gas is produced in paying quantities. The new leases, however, will bear the same date as the old ones.

Any sale or conveyance of lands subject to the act, by the agency having jurisdiction thereof, shall be subject to any lease or permit theretofore issued under the act.

New Rules to Lift Texas Crude Production Issued by Commission

IN two orders aimed at insuring maximum production, the Texas Railroad Commission last week liberalized its allowable rules on discovery wells and continued through January the state's general exemption from proration shutdown.

The special order on discovery wells was announced December 17. In the future, discovery wells will be allowed to produce at their most efficient rate, even though that exceeds the regular discovery allowable scale.

In the past, discovery wells have been allowed 20 bbl. per 1,000 ft. for 18 months or until six wells were completed in the field. The wells were then subjected to shutdown days and other proration restrictions. Under the new order, they will be allowed to produce at the maximum rate which does not damage the field.

Only East Texas field, which has shown some reservoir pressure drop in recent months, remains under shutdown restrictions during January. The statewide allowable order, issued December 18, continues East Texas field at 20 producing days and permits full 31-day production elsewhere.

The January allowable order is designed to result in a crude-oil production of 2,368,268 bbl. daily in Texas next month. This is 58,268 bbl. daily over the U. S. Bureau of Mines market demand estimate for January crude. The figure does not include 272,627 bbl. daily of natural gasoline and distillates which are expected to be produced in Texas in January.

The commission set the net allowable for January at 2,565,282 bbl. daily. Underproduction of 7.88 per cent or 197,014 bbl. daily is expected. Total estimated production of both crude oil and lighter liquid hydrocarbons during January is 2,582,627 bbl. daily.

The return of 108 bbl. of salt water, instead of 85 bbl., for each barrel of bonus oil production in East Texas field also was ordered by the commission. This action was based on recommendation of East Texas Salt Water Disposal Co.

Another order allows check valves for shutting off wells to be located as near the well head as the operator deems practical. Each well on a common line must have a separate check valve.

Block in Waskom Field Acquired by La Gloria

HOUSTON.—La Gloria Corp., Corpus Christi, has acquired a block of 5,000 producing acres along the west flank of Waskom oil and gas field, Harrison County, Texas, from E. C. Johnston, Longview independent operator.

La Gloria was disclosed to have paid $1,250,000 cash and an additional $750,000 out of production for the property. In the deal, La Gloria obtained leases on 31 tracts, 8 wells and equipment, and 30 pooling unitization and operating agreements. Johnston's assignment to La Gloria showed that the transfer of the property was effective December 15 and that it is subject to a one-eighth override by F. A. Fuller, Shreveport, independent operator.

The area was brought in for flush Travis Peak production late in 1946 by Johnston and Fuller.

Oil Man Nominated For Cabinet Post

WASHINGTON.—President Truman will nominate Mark Edwin Andrews, 44-year-old Houston oil man and lawyer, as assistant secretary of the Navy to fill the post left vacant by the promotion of W. John Kenney to be undersecretary, it was announced at the White House December 23.

Andrews, who served as an officer in the Navy during the war, specialized in oil and gas law, and from 1936 to 1942 operated oil properties in Texas and Louisiana.

——— this week

PIPE LINE—The Argentine 1,100-mile 10-in. natural-gas line is going forward at three points. . . . Scheduled to progress 3.6 miles per day. . . . ¶Welding operations on Texas Pipe Line Co.'s 172-mile 10-in. products line from Hearne, Tex., to Dallas to be completed January 1. . . . Pipe laying scheduled to be finished by middle of January. . . . ¶Mississippi River Fuel Corp. prepares for laying of nearly 120 miles additional looping. . . . ¶Sinclair Refining Co. is taking bids for construction of 185-mile 8-in. products line from Dallas-Fort Worth area to near Pauls Valley, Okla. . . . ¶Ozark Pipe Line System is making plans to equip eight pump stations with electric motors totaling 35,000 hp. . . .

REFINING—Army-Navy Petroleum Board is expected to largely influence disposal by WAA of some $7,000,000 worth of refinery equipment. . . . Material was originally earmarked as lend-lease for Russia. . . . ¶A natural gasoline plant is scheduled to be built near Rangely, Colo. . . . It will be built by The California Co., The Texas Co., and Stanolind Oil & Gas Co. . . . ¶Bayway refinery at Linden, N. J., increases its capacity 37 per cent. . . . Bringing total throughput to 176,000 bbl. daily. . . .

GOVERNMENT—Congress recesses after hearing many plans for dealing with oil-supply stringency. . . . Will resume inquiry in January. . . . Oil industry submits its program. . . . ¶Mild antiinflation bill passed. . . . Continues export controls. . . . Permits voluntary industry programs to meet shortages, exempt from antitrust action. . . . ¶Government's "acquired lands" opened to leasing under new regulations. . . . ¶Revised Marshall plan may give Europe less U. S. oil than anticipated. . . .

TRENDS—United States production of crude oil averages 5,299,955 bbl. daily during week ended December 20, an increase of 26,025 bbl. over last week. . . . Kansas records greatest gain with increase of 30,750 bbl. . . . Last week Kansas recorded greatest decline with a drop of 25,300 bbl. . . . ¶Well completions for the week ended December 20 totaled 669, a drop of 88 from the previous week. . . . Wildcat completions for the week totaled 17. . . . For the previous week, 7. . . . ¶Refinery runs to stills for week ended December 13 average 5,104,000 bbl. daily, a drop of 165,000 bbl. daily from previous week. . . . Gasoline production continues to decline. . . . Drops 346,000 bbl. over previous week. . . . Distillate output also shows drop. . . .

INTERNATIONAL—German refining industry to be stepped up in U.S.-U.K. bizonal area. . . . Result of breakdown of Foreign Ministers Council. . . . Exploration for German crude will also be pressed. . . . ¶Arab unrest over Palestine action slows work on Trans-Arabian pipe line. . . . But rumors that American concessions will be canceled are denied. . . . ¶Argentine Government contracts with American firm for drilling program. . . . Negotiating with another. . . . ¶Imports of Middle East crude to U. S. planned to meet domestic shortage. . . . ¶Colombian Congress adjourns without action on any oil bills. . . .

MERGERS—Sunray fails in attempt to form new major by merging with Pacific Western, Mission, and Skelly. . . . Legal complications blamed. . . . Future moves in doubt. . . . ¶Phillips affiliate acquires integrated Montana firm. . . .¶Pan American purchases stock of Root Petroleum Co. . . .

CONSERVATION—Texas Railroad Commission liberalizes allowable rules on discovery wells. . . . Continues through January general exemption from proration shutdown. . . . ¶Mississippi Commission issues gas order for Gwinville field. . . .

This International Number of The Oil and Gas Journal, with special reports and articles starting on page 153, contains little official information on the Russian petroleum industry because of that government's refusal to reveal activities. But this Soviet photo shows electric welders working on the 323-mile gas line from Dasheva in Western Ukraine to Kiev. The line was authorized in October 1946 by the Ministry of Construction of Fuel Industry Enterprises, but is not yet completed. It is designed to supply 176,500,000 cu. ft. of gas daily to 300 industrial enterprises and the city of Kiev, and will have a branch to Vinnitsa in the south

International

WORLD-WIDE OIL DEVELOPMENTS

German Refining Capacity Will Be Expanded; Exploration Stepped Up

by Warren W. Burns

OIL industry expansion plans in Germany, which were already well under way before last week's breakdown of the Council of Foreign Ministers, undoubtedly will be speeded up now that it is clearly evident that the Russian zone in Germany probably will remain behind the iron curtain.

As far as Germany's indigenous production is concerned, the majority of it is in the United States and British zones, with most of it in the British area. Daily production approximated 429,303 tons, or 11,800 bbl. daily, for the first 9 months of 1947. This compares with an estimated 1946 production of 12,400 bbl. daily.

During the last half of 1947, Standard Oil Co. (N.J.) shipped about 60,000 tons, or 1,200 bbl. daily, to the company's refinery, Ebano Asphalt-Werke, A.G., at Harburg. This refinery manufactures asphalt mainly. British oil officials, who attended the official reopening of the Ebano plant last September, estimated that this refinery would effect a saving to United States and British taxpayers of $2,700,000 a year by refining crude oil imports. To date, large quantities of petroleum products have been shipped to Germany and paid for largely by the United States and Great Britain.

First-Half 1948 Plans

Throughput of the Ebano plant in 1948 is expected to be stepped up sufficiently, on indigenous and imported crude oil, so that no imports of refined oil will be needed in the U. S. and British zones. In fact, during the first 6 months of next year, at least 120,000 tons, or 5,000 bbl. daily, will be imported by the following companies: Jersey Standard; a Royal Dutch-Shell company; Anglo-Iranian Oil Co., Ltd., and Socony-Vacuum Oil Co., Inc. Presumably this crude will be largely utilized by the Ebano plant and the Monheim refinery of Rhenania-Ossag Mineralowerke, A. G. (Shell).

Built in 1926, the Ebano refinery had a prewar throughput of 720,000 tons annually, or about 14,800 bbl. daily. During the war 80 per cent of the plant's capacity was destroyed and three of the company's storage tanks at private docks were hit.

With German economy crying for oil and British and American taxpayers footing the bill to supply refined oil products, the North German Oil Control (British Military Government organization controlling oil in the British zone) and Jersey Standard oil men turned to the bombed Ebano plant as the means of reducing the high import cost of refined oil which cost the taxpayers nearly $31 a ton or over $4 a barrel. Importation of crude (Venezuelan and probably Middle East) effects a saving of around $15 a ton.

Reconstruction work reportedly has boosted Ebano's refining capacity to 180,000 tons a year, or 3,700 bbl. daily, which in cash value to the United States-British taxpayers means a yearly saving of $2,700,000. The company hopes to increase the capacity in 1949 to effect a saving of $11,000,000. High value is being placed by economists on the production of bitumen which is shortly expected to reach 6,000 tons monthly, or 1,500 bbl. daily.

Indicative of the increased activity in exploratory work in Germany is a Reuters report that the North German Oil Control has applied to the Joint Export Import Agency in the Anglo-United States zone for the importation of seismic equipment, from the United States which it is hoped will arrive by next April. Unless new fields are discovered, it appears that Germany's indigenous production cannot be maintained at the level where it now stands.

In Bavaria, southern Germany, a drilling program is under way, but so far has failed to find any oil. One test, which was down to 700 m., or 2,240 ft., in November, has a projected depth of 2,000 m., or 6,400 ft. A German firm drilling at Wesendorf, near Hanover, reportedly struck oil at 1,829 m., or 5,853 ft., presumably the deepest producing well in Germany. The potentialities of this area will be defined by additional drilling.

In November, a test was spudded in the Ems area and the C. Deilmann Berghau (Mining) Ltd., reportedly has commenced drilling at Georgsdorf, southwest of the Ems area. Crude oil reserves on the German side of the River Ems total 7,850,000 tons, or 58,875,000 bbl., of which 3,800,000 tons, or 28,500,000 bbl., are proven and 4,050,000 tons, or 30,375,000 bbl., are probable. These statements are based on statistics of the Geological Office at Hanover. Crude oil reserves in other parts of North Germany are said to indicate that 2,388,000 tons, or 17,810,000 bbl., are proven and 360,000 tons, or 2,700,000 bbl., are probable.

Drilling Program Drawn Up

A drilling program has been drawn up by the Bayerische Mineraloelindustrie, A.G. (Bavarian Mineral Oil Industry), a subsidiary of Deutsche Vakuum Oel, A.G., for its concession in the Inn-River area east of Munich. Other companies are expected to participate. Activities are also expected to cover the Landshut - Neuoetting area.

By 1949, the North German Oil Control expects to import 2,000,000 tons annually, or 41,000 bbl. daily, of crude oil from the Middle East. It is believed that this, along with other imports of crude oil, plus Germany's small indigenous production, will cover domestic requirements for petroleum products. The program calls for the full utilization of all oil refineries in the United States-British bi-zonal area.

It is not known to what extent petroleum expansion activities will be affected in the bi-zonal area following the United States announcement December 17 that America will finance virtually the entire cost of

the British-American occupation of Western Germany (assuming an additional $400,000,000 liability heretofore paid by the British) in return for a controlling voice in the economic affairs of the area. But it may be assumed that the oil industry expansion there will not be hampered and probably will be stepped up.

The cost of importing petroleum products into Germany has been tremendous, and it is practically certain that the United States Government will explore all possibilities in keeping Germany's occupation costs down and petroleum expansion up.

The following figures, for the first 9 months of 1947, presumably were made available to Reuters by oil authorities in Hamburg. The figures, based on data from 27 oil fields, show the share which each company has in Germany's crude oil production.

	Production in first 9 months, 1947 (tons*)	Percentage of total 1947 prod.	Prod. since drilling began to Sept. 1947 (tons*)
German private firms—			
Elwerath Co.	107,888	25.1	2,707,000
German Crude Oil Co.	85,249	19.9	3,066,000
Wintershall Co.	78,524	18.3	1,371,000
Itag.	5,595	1.3	250,000
C. Deilmann	5,309	1.2	40,000
Other companies	2,188	0.5	.....
	284,753	66.3	.....
Foreign private firms—			
German Vacuum Oil Co.	47,176	11.0	1,235,000
Brigitta Co. (Shell and Standard Oil Co. of New Jersey)	46,510	10.8	533,000
	93,686	21.8	.....
Government-controlled companies—			
Preussag	31,566	7.4	819,000
Shaft Construction & Deep Boring Co.	14,275	3.3	55,000
Braunschweig Boring Co.	5,026	1.2	37,000
	50,867	11.9	.....
	429,306	100.0	10,113,000

*A metric ton is roughly equivalent to 7.6 bbl. of 40-gravity crude oil.

Production of crude oil in North-Western Germany in August of this year increased to 52,000 tons compared with 49,700 tons in July. The major increase was in the Georgsdorf field, Hanover, where output rose from 130 tons in July to 3,000 tons in August. The area's crude oil production this year will be from 15 to 20 per cent below last year's, according to German estimates.

In 1939 total production in North-Western Germany totaled 726,032 tons and in 1945 only 543,264 tons. The decrease is laid in part to the Nazi orders to produce as much as possible in the shortest possible time. Consequently, most of the wells had an output far in excess of sound engineering principles. In 1946 production here increased to 642,929 tons, with the 1947 estimates showing that output probably will drop to 530,000 tons.

Reasons for the probable decline in 1947 over 1946 are laid, in part, to the shortage of iron and steel, inadequate labor, and transportation difficulties, and no early improvement is seen, according to the German News Service in the U.S. zone.

Shipments Begin From Colombian Concession

With a potential of between 600 and 1,000 bbl. daily of 20°-gravity crude oil, Cia. de Petroleo del Valle del Magdalena, Colombian subsidiary of Socony-Vacuum Oil Co., Inc., has just commenced sending this crude from Cantagallo field on the left bank of Magdalena River, through a 2,500-meter (1½ miles) 4½-in. pipe line, to the Andian common carrier which runs along the right bank of the river.

This crude may find its way into export channels. Current production will come from four producers. The 30-year concession, which is Colombia's fourth commercial concession, became effective a year ago, but production got under way only late this month.

Dallas Firm Contracting For Argentine Drilling

Drilling & Exploration Co. of Dallas is contracting with the Argentine Government to drill 40 wildcat wells in various parts of the Argentine during the next 3 years. The contract has not yet been signed by the government oil company, Yacimientos Petroliferos Fiscales, but was approved by President Peron December 13.

Under the contract, Y.P.F. will buy four heavy and three medium rigs for the drilling program. The Dallas company will furnish supervisory personnel, tool pushers, and drillers, who will operate under John H. Lewis, Buenos Aires vice president and division manager for Exploration & Drilling Co. in Argentina. Argentine roughnecks and some Argentine drillers will be used. Two or three Y.P.F. engineers are expected to come to Dallas shortly to purchase the equipment.

Actual drilling is not expected to begin until the second half of 1948.

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WORLD-WIDE OIL DEVELOPMENTS

The tests will average 11,000 to 12,000 ft. for the heavy rigs, and 9,000 ft. for the medium rigs. The wildcats will be located in the Argentine Chaco, Mendoza Neuquen, and Patagonia and Tierra del Fuego areas.

Under the form of the contract, Drilling & Exploration Co. will be working with the Argentine Government, rather than in competition with it, which is tantamount to a labor-service contract, and in this respect it is similar to a contract the company has with the government of Brazil. The 3-year period of the contract will begin with the signature of Y.P.F., which is expected shortly. It is understood the contract price is approximately $12,250,000.

France, Italy Will Get 1,757,000 Bbl. From U. S.

WASHINGTON. — Petroleum and product exports to France and Italy from this country will amount to 1,757,000 bbl. under the interim-aid program, while 14,339,000 bbl. will be supplied from other sources, it is disclosed in testimony released last week by the House appropriations committee when it reported the measure to finance the program.

Shipments from the United States will include 700,000 bbl. of crude, 105,000 bbl. of fuel oil, 108,000 gas oil, 227,000 aviation gasoline, 595,000 lubricants, and 22,000 paraffin wax.

From other sources, the two countries are to receive 9,240,000 bbl. of crude, 2,485,000 bbl. of fuel oil, 866,000 gas oil, 103,000 kerosine, 45,000 aviation gasoline, 1,488,000 motor gasoline, and 112,000 bitumen.

Of the total of 16,096,000 bbl., France is to get 10,797,000 and Italy 5,299,000 bbl. Austria is to get 136,000 bbl. of oil and products, but they will come from her normal sources of supply and are covered in the program by the assignment of $1,000,000 for the purpose.

Anglo-Iranian's Production In Iran Drops in September

After reaching an all-time high in August, crude-oil production of Anglo-Iranian Oil Co., Ltd., in Iran, dropped to 1,577,000 tons, or 387,583 bbl. daily, in September. The August high was 2,056,000 tons, or 510,683 bbl. daily. September's output in 1946 was 1,572,000 tons, or 393,000 bbl. daily.

Total production from January 1 to September 30 of this year was 14,942,000 tons, or 410,494 bbl. daily, compared to the 1946 figures, for the same period, of 14,296,000 tons, or 392,747 bbl. daily.

Political Unrest Hampers Work On Trans-Arabian Line

NEW YORK. — Political difficulties in the Near East, particularly Arab resentment over the United Nations plan for partition of Palestine, are hampering work on the Trans-Arabian pipe line, but it is believed here the delays will be only temporary.

Despite a December 21 newspaper story reportedly published in Egypt stating that Saudi Arabia's King Ibn Saud had decided to reconsider his stand to protect American oil operations within his borders and might therefore cancel vast concessions held by Arabian American Oil Co., The Oil and Gas Journal was told early this week by one of the highest authorities concerned that this undoubtedly was not so.

But this authoritative source readily admitted that it was not known what stand the King might take if United States troops are ever sent to Palestine. From other sources it appears that the Cairo-inspired story might have resulted from some fanatical group which hopes the oil concessions in Saudi Arabia will be canceled.

Moreover, it is readily admitted by all concerned that the United Nations' decision to support the partition of Palestine may result in trouble over Saudi Arabia's oil concessions should the United States send troops there. It should be remembered that the King has stated that he believes the U. S. Government made a mistake and that "we hope you will correct it."

Meanwhile, every indication points to continued commercial relations between Aramco and King Saud.

While the Syrian Parliament has delayed ratification of Trans-Arabian Pipe Line Co.'s transit rights, chances are that this will only be a temporary delay and that some basis will be found for approval in the near future.

Ratification Delay Temporary

The delay presumably is because of the support the United States gave to the United Nations' decision to partition Palestine. Trans-Arabian, or Tapline as it is sometimes called, is an all-American company, being jointly owned by Standard Oil Co. of California and The Texas Co.

W. S. S. Rodgers, board chairman of Texaco and vice chairman of Arabian American Oil Co., which is also jointly owned by California Standard and Texaco, is now in Beirut, Lebanon, and last week was quoted as having stated that Saudi Arabia's King Ibn Saud personally assured him that he (the King) would continue to "give the oil companies every support." Presumably this will mean that King Saud will try to persuade the other Arab states in the Middle East to continue their negotiations and business relationships with the United States oil interests.

Speaking in his capacity as board chairman of Tapline, Rodgers told reporters in Beirut that with completion of the pipe line, approximately 85 tankers could be diverted to other essential postwar routes. Europe must have sufficient oil, he explained, to make the Marshall plan work and indicated that the huge crude oil reserves in the Persian Gulf area are the quickest source of supply.

Meanwhile, construction work on the projected 1,040-mile 30-31-in. crude oil pipe line has been temporarily halted in Syria, Lebanon, and Trans-Jordan, due to the attiture of the nationals. Route of the pipe line would run through these countries for approximately 200 miles. In Saudi Arabia, however, the work reportedly is proceeding in a normal fashion.

Socony-Vacuum Lands Third Middle East Tanker Cargo

WHILE nothing is being said officially about Middle East oil imports coming to the United States in increasingly substantial amounts, there is already evidence that at least one company, Socony-Vacuum Oil Co., Inc., has passed the "testing stage," (i.e., of running Saudi Arabia's sour crude through its refineries).

This past week, Socony-Vacuum brought its third tanker cargo of Middle East oil to Paulsboro, N. J., where the company has a refinery. The third tanker, the Hampton Roads, docked with 21,934 tons of crude oil, roughly equivalent to 164,505 bbl. A fourth tanker, the French Creek, was scheduled to load another 15,000 tons (112,500 bbl.) at Ras Tanura, Saudi Arabia, on December 22 and to arrive at Paulsboro about January 18. The Hampton Roads made the Ras Tanura-Paulsboro run in just 25 days.

Commenting on these imports, Socony-Vacuum said that it is being done "to assist in alleviating impending shortages of fuel oil and gasoline in the eastern United States."

A.P.I. gravity of Saudi Arabian crude oil from the Dammam field is 35° and from Abqaiq, 37°. Processing of this crude shows that it is characterized by a yield of approximately 40 per cent gas oil. Sulfur content ranges from 1.3 to 1.6 per cent by weight. However, all Saudi Arabian crude is stabilized before offshore shipment. All of the hydrogen sulfur is driven off and the remaining sulfur in the stabilized crude is from 80 to 90 per cent thiophene sulfur and thus relatively stable, inert, and noncorrosive at temperatures below the cracking range—900° up. Moreover, the salt content constitutes no problem as the percentage is extremely low and salt will run from zero to an extreme high of 6 lb. per 1,000 bbl.

With the exception of its first tanker load of Persian Gulf crude, which was purchased from Kuwait Oil Co., Socony-Vacuum will have taken the three additional tanker loads from Saudi Arabia as part of its pro rata share. Although final negotiations, whereby this company will become a 10 per cent partner in Arabian American Oil Co., have not yet been consummated.

Socony-Vacuum has voyage chartered the Hampton Roads which has a crude-oil capacity of 164,505 bbl and a sister ship, the Nash Bulk, for a 4-year period at rates 7½ per cent under U. S. Maritime Commission rates. It is believed that one or both ships will be engaged largely in transporting Middle East oil, and probably on additional runs in 1948 to the United States Coast.

Presumably Standard Oil Co. (N.J), which eventually will become a 30 per cent Aramco partner, will soon start lifting crude oil from Ras Tanura on a pro rata basis. At present Jersey Standard is getting products from the Ras Tanura refinery and anticipates getting a larger share in the near future, but these products reportedly will be distributed only in the Eastern Hemisphere.

According to a high-ranking Jersey Standard official, his company has under serious consideration the possibility of moving Middle East crude oil to the United States east coast in the near future. But so far this has

not been possible for his company, he said, because of the lack of tankers. It is practically a certainty that Jersey Standard will join Socony-Vacuum in this movement, but probably not for at least a couple of more months.

Bordeaux Refinery Work to Be Stepped Up Shortly

Reconstruction and expansion work on the Bec D'Ambes refinery located 20 miles below Bordeaux, France, which is already under way, probably will be stepped up shortly. George H. Zarafanetis, who will be the chief engineer and construction superintendent, left New York for France last week.

This refinery, being built by the Societe Raffineries de Petrole de la Gironde, an affiliate of California-Texas Oil Co., Ltd., is on the site of Texas Co.'s prewar 8,000-bbl.-daily plant which was badly damaged by bombing in 1944. It is on the Gironde River which runs to Bordeaux.

With a projected capacity of from 12,000 to 14,000 bbl. daily, the refinery initially will include crude distillation and reforming equipment. Eventually cracking units will be installed. At present the world-wide shortage of steel and other construction material is retarding the expansion program somewhat.

The French Government is particularly anxious that this plant be on stream as soon as possible and consequently is rendering considerable assistance. Victor Peytral is president, with W. M. Brewster as vice president. Henri Bouvier is managing director.

Fuel Shortage Heightens Search for Oil in Spain

Recent restrictions on gasoline consumption in Spain, coupled with the fact that a deep test is being drilled on the Oliana structure in the Province of Lerida, have caused attention to be focused on the search for oil in local areas.

The Oliana test, which is being drilled by Cia. de Investigaciones y Exploraciones Petroliferas, S.A. (Ciepsa) was down to approximately 5,300 ft. late in November. Its projected depth is 8,000 ft. Ciepsa is jointly owned by Socony-Vacuum Oil Co., Inc., and a subsidiary of the Spanish Cie. Espanola de Petroleos.

Reuters reports from Madrid that Don Agustin Marin Bertran de Lis, a Spanish geologist, said there is evidence in Catalonia and Castille that there are small petroleum deposits there which could be developed to solve some of Spain's shortage difficulties.

A program in Spain calls for the production of synthetic oil products, but the plant of the National Industrial Institute, which is now being built at Puertollano, has a projected capacity of 100,000 tons of products yearly.

Schoonbeek Production To Record Large Gain

NEXT year's daily crude-oil production from the Dutch oil fields at Schoonbeek (formerly known as Coevorden) will approximate 248,000 tons, or around 5,000 bbl. daily, according to a Reuters dispatch from Delft in the Netherlands. The news agency states that this figure was disclosed this month by N. V. de Bataafsche Petroleum Mij., one of the three principal operating companies of the Royal Dutch-Shell group.

In 1946, Holland's oil fields produced 60,000 tons, or approximately 1,200 bbl. daily. In the closing months of this year, the output reached 17,000 tons per month, or approximately 4,000 bbl. daily. Current domestic requirements in Holland run around 125,000 tons a month, or 31,000 bbl. daily.

Meanwhile, shareholders of Shell Transport & Trading Co. have unanimously agreed to increase the company's capital to £53,000,000, or about $212,000,000, to help finance "an immense development program," including the erection of two complete refineries to run on Middle East crude oil. The program also envisions the importation of Shell crude from Venezuela. Sir Frederick Godber, board chairman, explained that the current demand for oil in the "sterling bloc" was by no means fully met by "sterling oil" and that essential purchases of "dollar oil" were heavy.

Maintenance of the Shell group's present supplies of "sterling oil" is thus a vital necessity, it was explained. The concentrated increase in the "sterling" supplies which Shell's program would make possible would not only reduce dollar expenditure on oil supplies, but would enable the switching of Caribbean crude oil to the United States, thereby increasing earnings of desirable foreign exchange.

Shell's program up to the end of 1949, calls for financing approximating £105,000,000, or $420,000,000, of which the parent Shell company, as holder of 60 per cent interest in the group, would provide £63,000,000 or $252,000,000.

The Netherlands Oil Co., jointly owned by Shell and Standard Oil Co. (N.J.), with Shell having the controlling interest, just recently completed plans to start drilling at Delft.

First Half of 1948 Appears Bright To Colombian Oil Industry

NEW YORK.—First half of 1948 may be most significant in so far as the oil industry in Colombia is concerned. Both governmental and oil officials anticipate a program for greater and more widespread exploratory activities.

The Colombian Congress adjourned December 16 without having passed the projected oil bill which was submitted to congress August 29 and on which the nation's president specifically recommended approval. Congress also failed to pass the so-called "Colombia Y.P.F." enterprise which presumably would have been aimed at taking over Tropical Oil Co.'s De Mares concession when it expires in 1951. Another bill which failed passage was on income tax which would have exempted the oil industry from the patrimony levy during exploration and grant an adequate and equitable depletion rate.

The oil bill, in failing to get congressional approval, met the same fate as 10 previous oil bills submitted since 1942. However, the latest oil bill is not dead and will be taken up again by Colombia's senate oil committee at its regular session next July. An extra session for congress reportedly will not be called.

When the senate resumes study of the newly projected oil law, chances are that more attention will be given provisions to adjust the law along the line of suggestions contained in the recent memorandum submitted by Colombia's oil industry to the house oil committee. Petroleum Minister Tason's concession-granting policy under the oil law, and quick action on concession bids now pending, would permit the oil industry to adjust its concession position within the next 6 months so as to continue Colombia's petroleum exploratory program without interruption.

By mid-1948, Colombian coffee, the price of which is just double the pre-1945 ceiling, is expected to slump. If so, this would place oil in a more favorable position, particularly as a source of dollar exchange to compensate a possible coffee price drop, as coffee goes so goes Colombia's economy—and therefore, presumably, any future favorable oil legislation.

WASHINGTON WATCHING

BY BERTRAM F. LINZ

Aid Costs Up

WASHINGTON.—Cost of supplying the United States-British zones of Germany and Japan and Korea with petroleum products during the current fiscal year will be two-thirds more than originally anticipated—$65,800,000 instead of $36,761,000.

Current estimates show that those areas will require a total of 2,708,700 metric tons of products, of which 235,658 tons will be supplied by the British, whose contribution is valued at $5,939,000.

A little more than half of the total, 1,474,560 tons, will be required for Japan and the Ryukyus at an estimated cost of $33,787,000. The original appropriation provided $23,345,000, and an additional $10,442,000 will be needed.

Germany's quota, for the combined zones, is 992,573 tons to cost $24,886,000. The appropriation provided $8,718,000 and, after allowing for the British contribution, an additional $10,229,000 will be required.

The United States zone of Korea will require 241,567 tons at a cost of $7,117,000, of which only $4,698,000 was provided, necessitating a supplemental $2,418,000.

The major products to be supplied by the United States are 1,520,927 tons of diesel oil, 1,069,268 tons of it for Japan mostly for its fishing industry; 634,786 tons of gasoline, 109,394 tons of kerosine and 99,308 tons of lubricating oil. An additional 104,508 tons of gasoline and 131,150 tons of diesel oil will be provided in Germany by the British.

Refinery Equipment Disposal

DISPOSAL by War Assets Administration of some $7,000,000 worth of cracking and other refinery equipment originally destined to be lend-leased to Russia probably will be largely influenced by the Army-Navy Petroleum Board.

The board for some months has had an agreement with WAA to review all prospective sales of refineries and refinery equipment with a view to selecting purchasers who will agree to set aside a specified proportion of their output for the military.

The arrangement was made when the ANPB found it was becoming increasingly difficult to get offers from the oil industry for the products it sought to procure. At the end of November, the military were still 4,829,000 bbl. short of their needs for the 6 months ending December 31.

Several of the government plants disposed of by WAA have been transferred under this arrangement, and it is expected ANPB will take an active interest in seeing that the equipment which has been declared surplus by the State Department goes to companies that will agree to supply military requirements.

More Conversion

A BITTER fight is going on behind closed government doors over a proposal emanating from sources within the Military Government at Berlin to shift the German economy from coal to oil.

Some officials in Washington have long criticized the AMG for what they consider its failure to take a realistic view of the situation with which they are dealing, and the apparent preoccupation with decartelization which, they charge, has stymied all efforts to get German private industry in the United States zone going again. The British, these officials say, have approached the problem in a more practical way and have things moving considerably better in their zone.

Citing the proposal to put Germany on an oil basis as an example of the muddled thinking which they assert runs through the AMG organization, they point out that it fails to take a number of vital factors into consideration. Two of those factors would directly affect the Germans themselves. One is the traditional importance of coal to the German economy, from both the employment and operating standpoint, and the other is the much greater cost which oil would impose on the Germans once they were up on their feet and American support was withdrawn.

Military Concern

State Department and military officials who are understood to oppose the plan have pointed out those factors but are stressing an even more important one—the impossibility of providing as much oil as would be required under any such proposal. The military particularly is worried about this angle, since it would fall on the Army-Navy Petroleum Board to handle the procurement and that agency for many months has been very worried over their difficulties in getting requirements already programmed.

The House Appropriations Committee recently went into another matter of the same sort—a reported proposal to merge and extend social security to an extent not even attempted in the United States, which Bavarian officials protested would be extremely costly. After questioning, Army Secretary Royal submitted a memorandum stating that occupation officials had dropped the proposal, which was played down as of no great importance.

Government Rubber

WITH the rubber industry itself split on the question of the sale of Government-owned synthetic rubber plants, it is considered probable in Washington that Government operation of at least a substantial proportion of those facilities will be continued for another year or two.

The House Armed Services subcommittee headed by Rep. Paul W. Shafer of Michigan is now writing a report and recommendations based on several weeks of hearings on national rubber policy. Shafer is hopeful of having the report ready for submission to the House shortly after Congress reconvenes next month.

Indications are that the committee will recommend continuance for 1 or 2 years longer of the present law requiring the use of synthetic rubber in automobile tires and tubes, but will suggest termination or modification of the wartime patent pooling arrangement, which still is in effect.

A third point in the program is likely to call for a minimum production of 250,000 to 300,000 tons a year of synthetic rubber. Suggestions as to output varied widely, and those figures are believed to be as low as could be permitted with safety.

Companies operating the Government plants are anxious to have the question of final ownership settled as soon as possible, but considerable argument was presented to the subcommittee for continuance of present policies until the rubber situation has been better stabilized.

Rubber Pact Held Up

DISCOVERY of a "joker" in the new reciprocal trade agreement with Britain that might imperil the United States synthetic rubber industry has resulted in the suspension, "for renegotiation," of a whole section of the agreement, which is to go into effect January 1.

The joker was disclosed by Rep. Carl T. Curtis of Nebraska, in the form of a provision that, in the event the quantity of general purpose synthetic rubber required to be consumed in this country exceeds 25 per

cent of the total rubber consumption of the United States, an entire section of the agreement providing for reductions in the Empire preferences might be suspended for a full year. *(The Oil and Gas Journal, December 20, page 52.)*

When the import of this provision was brought to the attention of State Department officials they took another look at the agreement and decided it might be well to talk the matter over further with the British before it went into effect under a proclamation issued by President Truman December 16 making the 23-nation treaty effective January 1 with respect to those countries which were prepared to make operative on that date the concessions they are to grant United States trade.

Department officials admitted that the full meaning of the provision "did not become clear" until after the Geneva conference at which the agreement was negotiated.

The ironical part is that some idealistic State Department men who have always been afraid of doing something that would make other countries say the United States was trying to hook them now learn distressfully that there are sharp traders elsewhere in the world, too.

Tidelands Legislation

WITH hearings on the restoration of the California tidelands to the state set tentatively by the Senate judiciary committee for February 15, considerable interest is being displayed in legislation which the Department of Justice is drafting for administration of those lands by the Government.

Grapevine reports are that Asst. Atty. Gen. John Sonnett, head of the antitrust division, is drafting a measure which is full of dynamite for the present operators on the lands. These reports vary considerably regarding the contents of the bill, one version being that it provides for a check on company operations to determine what profits have been made and whether the operator has taken out his investment in the property before granting him a lease.

Under such a provision, it is foreseen that some operators might be tossed off the lands they occupy under leases from the states, with subsequent law suits which might keep the issue in the courts for years.

The measure also has some jolts for the other waterfront states. Instead of dealing only with the California situation, it is said, it will cover all three coasts, right out to the limits of the Continental Shelf.

Reportedly, lease areas will be liberal, with prospecting permits covering as much as 100 sq. miles and permanent leases, where discoveries are made, of as much as 7,000 acres in one block, which it believed sufficient to protect any big structure found.

In some quarters, a bill of this sort is seen as meeting quick death at the hands of congressional committees. But it is still pretty much in the talking stage and certainly has not yet reached the desk of Atty. Gen. Tom Clark, whose own views on what will be required to protect the public interest are believed to be much milder.

Several interdepartmental conferences have been held on the legislation, with Interior Department experts reportedly protesting loudly—but vainly—against anything so radical as the tossing out of an operator simply because he may have made some money out of a lease.

Pan American Buys Majority of Root Common Stock

NEW YORK.—Purchase of a majority of the common stock of Root Petroleum Co. by Pan American Petroleum Corp. was announced jointly by Bruce K. Brown, president of Pan American, and D. P. Hamilton, president of Root, December 17.

Pan American puchased 132,000 shares of stock owned by Hamilton and his family and sufficient shares from other stockholders to obtain a majority of the outstanding shares, and is offering to purchase other Root stock at the same price, $25 per share.

Hamilton, who participated in the organization of Root a quarter century ago and for many years has been its president and principal stockholder, has retired as president but will remain a director of the company.

Benton New Root President

New president of Root will be Dwight F. Benton, who is resigning as general manager of the lubricating and sales technical service departments of Standard Oil Co. (Indiana). Pan American, which has its principal office at New Orleans, is a subsidiary of Indiana Standard. Horace Cannon will continue as executive vice president of Root, and other officers and department heads will remain in their present capacities.

Root's principal office is at Shreveport, and its major property is a modern refinery at El Dorado, Ark., which runs 20,000 bbl. per day of crude oil, operates a fluid catalytic cracking unit, and produces high-quality gasoline and a full line of other petroleum products. Crude oil moves to the refinery from fields in Arkansas and Louisiana via Root's own pipe lines, and products are supplied to Arkansas and other markets by tank car and via pipe line to Helena, Ark.

The joint announcement indicated that Root would continue in the business of selling petroleum products in bulk to present customers, including Pan Am, and that no drastice changes in company policies are contemplated.

Wasatch, Ada Purchase Capital Stock of Two Firms

All capital stock of Home Oil & Refining Co. and A. B. Cobb & Co., both of Great Falls, Mont., has been purchased by Wasatch Oil Co. of Salt Lake City, and Ada Oil Co., a jobber, of Houston. Wasatch is a subsidiary of Phillips Petroleum Co., of Bartlesville, Okla.

The two Great Falls firms, both headed by A. B. Cobb, constitute a completely integrated oil operation and one of Montana's largest independent operators. In addition to a refinery at Great Falls, the two concerns own 43 bulk and service stations in the state; some 200 producing wells in Cut Bank, Pondera, and Kevin-Sunburst fields; a number of proven undrilled locations in these and other Montana fields; crude-oil gathering systems in Cut Bank and Pondera; a pipe line connecting these fields, and tank farms with about 250,000 bbl. of storage.

At the same time, reports were current in Houston that Phillips Petroleum Co. is negotiating for purchase of most of the marketing facilities of Pure Oil Co. in Texas and Louisiana. Involved in the deal are about 30 service stations as well as various wholesale outlets in the two states. Pure will retain its facilities in the Beaumont area, which is supplied by Pure's Smiths Bluff refinery.

Phillips entered the marketing field on the Gulf Coast about a year ago. Acquisition of Pure's outlets would give Phillips substantial marketing operations in the region. The purchase price in the transaction is reported at about $1,500,000.

Gulf Oil Corp. Plans New Production Laboratory

HOUSTON.—Gulf Oil Corp. will begin construction here about January 5 on a new chemical and geological laboratory building for the company's production division.

The two-story, steel-frame, stone and brick structure containing about 17,500 sq. ft. of floor space will be located in West Houston. Completion is expected August 1. Laboratory facilities will be provided in the fields of sedimentology, paleontology, soil testing, core analysis, oil analysis, materials testing, corrosion and paint, and cement.

Gulf's civil-engineering department in Houston designed the building. R. E. Sullivan, Houston, has the general contract.

Sunray Drops Plan to Merge Pacific Western, Mission Corps.

SUNRAY OIL CORP. has abandoned its plan to merge with Pacific Western Oil Corp. and Mission Corp. and thus gain control of Skelly Oil Co.

Failure was caused by a legal question raised against the authority of trustees of the Sarah C. Getty trust in California to sell Pacific Western stock owned by minor members of the Getty family. Getty interests own approximately 85 per cent of the outstanding stock of Pacific Western. This company owns about 47 per cent of the stock of Mission which, in turn, owns 59 per cent of Skelly Oil stock. Sunray had proposed to purchase all Pacific Western stock and to exchange Sunray stock for Mission stock, thus combining the three companies and making Skelly Oil Co. a subsidiary of Sunray.

Clarence H. Wright, president of Sunray, announced the failure in New York December 21, and immediately left for Tulsa. Under the merger terms, Sunray's option to purchase the Getty stock was to expire December 23. Wright said that Sunray had arranged to obtain the $87,000,000 needed to finance the deal but it would not be attempted because of the opinion of California attorneys that court approval would be necessary for sale by the trustees of stock owned by minors, totaling about 51 per cent of outstanding Pacific Western shares.

Getty's Statement

In a statement to The Oil and Gas Journal, December 22, J. Paul Getty who with the Sarah C. Getty trust, owns approximately 85 per cent of the common stock of the Pacific Western Oil Corp., explained: "While attorneys of the trust feel that the trustees have full authority to dispose of the family stock interest in Pacific Western as provided in the merger, the right has been questioned by attorneys representing a financial concern. Owing to this and other developments it is apparent to me that the present trust situation should be corrected and made workable by legal action if required. I propose to initiate this action immediately. Pending the completion of these details involving the trust ownership no further offers will be considered by me."

It is understood that in addition to the Sunray company two other buyers have made overtures looking to the purchase of the Getty interests in Pacific Western. Getty left Tulsa December 22 for his home at Santa Monica, Calif.

The proposed merger has been beset with legal difficulties since the plan was announced in September.

W. G. Skelly, president of Skelly Oil Co. and a minority stockholder in both Pacific Western and Mission, claimed that the terms were unfair to minority stockholders and were framed to benefit certain directors of the two companies. He initiated a proxy campaign to stop the merger and also brought actions in federal courts in California and Nevada where the two companies maintain legal headquarters. In Nevada the court issued a temporary injunction preventing Mission stockholders from meeting to vote on the merger terms until the court could examine Skelly's accusations in more detail. When an appeal to the federal District Court failed to have the injunction set aside, Sunray began negotiations for direct cash purchase of the Getty stock in Pacific Western.

In his proxy solicitation, Skelly had promised that if the merger were dropped he would bring action to liquidate Mission if necessary taking legal steps to prevent Pacific Western from blocking his plan through its minority holdings. In the event of liquidation, Skelly promised Mission stockholders the equivalent of 42.4 per cent of one share of Skelly Oil and 97.6 per cent of a share of Tide Water Associated Oil Co. stock for each share of Mission.

Mission owns approximately 21 per cent of the outstanding stock of Tide Water Associated and another 9 per cent is owned by Pacific Western. Stockholders of Tide Water Associated have authorized their directors to purchase and retire any or all of this stock that might be placed on the market, at not more than $25 per share.

Tritschler Hits Wage-Hour Proposals

WASHINGTON.—Labor - union proposals that the status of executive and professional workers under the Wage-Hour Act be confined to employes receiving $500 a month or more were opposed before the wage-hour administrator last week by representatives of the oil industry.

James R. Tritschler, Standard Oil Co. (Ohio), told the administrator that it would be unsound to adopt an arbitrary standard, and classification of workers should be based upon the actual rates of pay in representative industries.

Tritschler charged that adoption of a $500-a-month standard would be seized upon by the unions for "their own selfish purposes," and declared such arguments from the unions as the alleged "extraordinary profits of corporations" and an "industry and congressional drive to still further destroy the living standards of the American people" should not be permitted to stampede the wage-hour division into unwise action.

He urged that the administrator set a salary of $200 a month for executives and $250 a month for administrative and professional employes, and warned that "salary tests higher than those suggested will inevitably deprive employers of the right of exemption of many employes whom Congress clearly contemplated should be considered as exempt because they are bona fide executive, administrative, and professional employes."

A statement also was made by Donald C. O'Hara on behalf of the National Petroleum Association and the Western Petroleum Refiners Association in opposition to the union demand for a $500 minimum and also objecting to another proposal, by the wage-hour administrator, to reduce the amount of nonexempt work permitted a supervisor from 20 per cent of his time to 8 hours per week.

O'Hara urged that the administrator adopt bodily the definitions for executive and supervisory employes that are used in the Taft-Hartley Act which then, he said, would become a clear legislative standard and make it possible for employers to classify employes in the same way under different federal statutes.

The question of wages in the oil industry will come up again next month when representatives of the Mid-Continent Oil and Gas Association and a number of drilling contractors will give the views of the production branch of the industry.

Old Hanlon Associates Form New Company

Three former associates in the oil and natural-gasoline business have reunited to form a new company, Hanlon-Boyle, Inc., with offices in Tulsa, to engage in the general business of developing and operating oil and gas properties.

They are E. I. Hanlon, J. H. Boyle and M. F. Waters, all formerly connected with a group of concerns bearing the Hanlon name which were purchased by Warren Petroleum Corp. in 1946.

Industry Poised to Begin Voluntary Allocation Program on Fuel Oils

WASHINGTON.—With its program for alleviation of the fuel-oil shortage already worked out, the petroleum industry this week was awaiting only a green light from Oil and Gas Division Director Max W. Ball to put into effect the first voluntary program approved under the Taft bill.

Ball, in turn, was waiting only for word that President Truman had signed the measure to set up a coordinating committee of industry representatives, which will serve until March 31, next, in a general advisory capacity to government, state, and industry members.

Aside from his contact with the committee, Ball will leave the matter almost entirely in the hands of the industry, since OGD at the moment is without sufficient funds to develop any sizable staff to take an active part in the program. At the same time, this is entirely within the sense of the legislation, which did not call for government management of the voluntary programs, for which it provides protection against antitrust prosecutions.

The industry's program was laid before Chairman Wolverton of the House interstate commerce committee December 19, and was given approval in a resolution adopted by the committee following 2 days of conference with government and industry men.

The resolution also called for extension of export control authority; use of naval vessels for transportation of oil to sections where shortages exist; suspension of transfers of tankers by the Maritime Commission to foreign buyers, and an effort to have recalled for domestic trade vessels already transferred, and prompt repair and operation of all commission tankers not now in service.

The industry program calls for public cooperation in the conservation of fuel oil and gasoline; reduction of government consumption to the maximum extent possible; adjustment of refinery yields to maximize distillate output, regardless of the effect on gasoline supplies; full employment of Maritime Commission, Navy, and Coast Guard tankers, and extension internationally of the relaxation of load line now allowed coastwise vessels; full use of all oil-industry tank cars, including 6 and 7-day loading and unloading schedules, and extension of truck movement; adoption of maximum allowables by state authorities as facilities for use of additional crude become available, and the setting up of state emergency fuel coordinators.

It is expected that the industry coordinating committee will secure the necessary office space in Washington and get into operation next week.

McCarthy Discusses Oil Program With Argentina

HOUSTON.—Glenn H. McCarthy, Houston independent oil operator, disclosed here December 22 that he discussed a $290,000,000 oil-development program with Argentine President Peron during his recent 18-day trip to Argentina.

McCarthy said he is now awaiting word from Argentina as to whether the plan has been accepted by the government. He said he is ready to undertake the program beginning in 1948.

McCarthy spoke only generally as to details of the proposed development and indicated information should come from Argentine officials.

The proposed arrangement for McCarthy's services, however, does not involve acquisition by him of any producing oil properties in Argentina. McCarthy said the plan he outlined embraces all phases of both the oil and gas industry, exploration, producing, pipe lines, and refining, including petrochemical development.

The Houston operator expressed the opinion Argentina has large undeveloped oil resources in both domal and fault structures. He said the program which he had discussed with the government officials would fit in well with Peron's current 5-year plan.

McCarthy returned early this month from his trip by air to Argentina. His party included a number of officials of his organization *(The Oil and Gas Journal, December 6, page 57)*.

Mississippi to Consider Oil-Board Legislation

JACKSON, Miss.—The Mississippi Legislature, convening here early next month, is expected to consider proposed legislation for a full-time state Oil and Gas Board.

One of the principal advocates of this measure is Atty. Gen. Greek L. Rice, who is a member of the board as it is presently constituted. It is his contention that the state officials now serving on the board do not have the time to spare from their other duties properly to handle the many oil and gas matters that arise.

The editorial staffs of The Oil and Gas Journal and its affiliated bilingual Latin-American publication, Petroleo Interamericano, met in Tulsa last week to plan the 1948 program. Luncheon meetings were addressed by J. M. Gardner, vice president of Lofland Brothers Co., and J. R. McWilliams, vice president of Carter Oil Co. The meeting concluded with a dinner at the Tulsa Club, a view of which is shown here

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Wire New President Of Loffland Brothers

R W. (BOB) WIRE, effective January 1, will become president and general manager of Loffland Brothers Drilling Co., with headquarters in Tulsa. Wire, who is widely known throughout the oil and gas industry because of his 25-year connection with National Tube Co., has resigned his position as manager of southwestern sales for National Tube, with headquarters in Dallas, to accept the new position.

Wire was born at Lorain, Ohio, and graduated from Miami University of Oxford, Ohio. He was first employed by National Tube Co. as field engineer. During the war he was sales manager of Tubular Alloy Steel Co. (U.S. Steel) of Gary, Ind. Later he was assistant general sales manager of National Tube Co. with headquarters in Pittsburgh, and in 1945 became manager of southwestern sales for the company. He is a member of several organizations affiliated with the oil industry.

A. P. Allison, former district geologist for Sun Oil Co. in Houston, has assumed his new duties as head of the geological department in the recently opened Shreveport office of the company.

D. W. Adkins, Jr., Ohio Oil Co., Shreveport, has been elected chairman of the East Texas section of the American Institute of Mining and Metallurgical Engineers. Other officers named were: **Don M. Kerr,** Kerr Engineering & Construction Co., Kilgore, Tex., vice chairman; **J. M. Shepperd,** Humble Oil & Refining Co., Tyler, Tex., secretary-treasurer; and directors **R. T. Wade,** Schlumberger Well Surveying Corp., Shreveport; **Phil J. Lehnhard,** East Texas Engineering Association, Kilgore, and **L. H. Dial,** East Texas Salt Water Disposal Co., Kilgore.

H. H. Mundy is president of the newly formed Marjo Oil Co. organized in Pawhuska as an Oklahoma corporation. Other officers of the company are **J. H. Ward,** vice president, and **Harry Smith,** secretary-treasurer. Directors of the company include the three officers and **Sam P. Smith.**

E. A. Landreth, Fort Worth independent oil operator, received the 1947 Civic Award from the Chamber of Commerce for his work as finance chairman in raising funds for building expansion of Texas Christian University.

H. P. Slagel, district superintendent for Byrd-Frost, Inc., at Midland, Tex., has been transferred to Durango, Colo., to direct operations of the company in the Rocky Mountain region. **William Byrd** of Dallas will succeed Slagel as district superintendent in the Midland area.

R. F. White, formerly in the Michigan office of Sohio Petroleum Co., has been placed in charge of the new marketing office to be established at Wichita. The Dallas office will be moved to Wichita Falls with **R. G. Bandy** in charge.

Dr. L. W. Blau, research consultant for Humble Oil & Refining Co., Houston, and chairman of the Engineering Council of Houston, has been chosen president of the Texas Academy of Science. Among the new vice presidents of the Texas academy is **Dr. Frank H. Dotterweich,** Texas College of Arts and Industries, Kingsville.

New president of the Oil Men's Club of Houston is **Fred J. Shipley,** with the tender department of the Oil and Gas Division in the Houston office of the Texas Railroad Commission. Other new officers are **Joe Owens,** South Texas manager, Sun Oil Co. and Sun Pipe Line Co., vice president of the club, and **George Miller,** sales manager, Shell Pipe Line Corp., secretary-treasurer. **Miss Bernita Jurchak,** formerly with the Houston office of the Railroad Commission, is assistant secretary-treasurer. The club is a social group which holds luncheon meetings the second Thursday of each month.

W. James Bichan, previously assistant professor of geology at the University of New Brunswick, has been named director of mineral development for the Natural Resources Department of the province of Saskatchewan.

L. W. Witte, assistant traffic manager of Mid-Continent Petroleum Corp., has been promoted to traffic manager. He succeeds H. W. Roe, who died recently. **Harvey W. Lechner** has been named first assistant traffic manager.

C. H. Danchertsen, chief engineer at Seminole for Amerada Petroleum Corp., has been transferred to Midland, Tex., to serve in the same capacity. **Jack L. Colson** of Tulsa will succeed Danchertsen.

Overton A. Matthews, of a Toronto accounting firm, has been named a director of International Petroleum Co., succeeding **L. F. McCollum,** New York City, who recently resigned to become president of Continental Oil Co. Matthews previously had visited several of the company's principal operating and administrative points in South America.

T. A. Post, manager of Ultramar, S.A.P.A., has returned to Buenos Aires after several months in New York, where he was on a combined business and vacation trip. Ultramar is owned by The Texas Co. and Socony-Vacuum Oil Co., Ltd.

Frank W. Abrams, chairman of the board of Standard Oil Co. (N. J.), has been named chairman of the Commerce and Industry Committee of the Manhattan division, Red Cross 1948 Fund of Greater New York. The committee, under Abrams' guidance, includes 10 section chairmen and more than 350 division chairmen, representing every phase of the city's commercial and industrial life. Abrams, who was elected to the board of directors of Standard Oil Co. of New Jersey in 1927 and became president 6 years later, has been active in the evolution of oil refining into the varied chemical and physical processes of today.

William F. Brown, safety director, Consolidated Edison Co. of New York, Inc., has been appointed chairman of the Accident Prevention Committee of the American Gas Association.

C. T. Plake, formerly chief of the ad valorem tax department of Gulf Oil Corp., Tulsa; **Green Prescott,** ad valorem tax agent for Pure Oil Co., Fort Worth; and **A. J. Wells,** formerly chief of the ad valorem tax department of Carter Oil Co., Tulsa, were recently presented with distinguished-service awards at the annual ad valorem tax forum of the Mid-Continent Oil and Gas Association at Jackson, Miss. **Clarel B. Mapes,** secretary-treasurer of the Mid-Continent Oil and Gas Association, made the presentation.

H. W. McCobb, a director of Standard-Vacuum Oil Co., has just returned to New York after a 6-month tour of the Far East. McCobb, who was a colonel in the U.S. Army during the last war, worked for Standard-Vacuum for many years in the Netherlands East Indies prior to hostilities.

Alec M. Crowell, of Jackson, Miss., and Shreveport, petroleum consultant and producer, has been retained by the general legislative investigating committee of Mississippi to make a thorough study and investigation of the state's oil and gas-collection methods. Crowell, who was former director of the Mississippi oil and gas engineering committee, is expected to report his findings to the committee about the middle of January at which time the 1948 regular session of the legislature will be getting under way. Crowell at one time served as chief gas engineer for Texas and later organized and directed the Arkansas Oil and Gas Commission.

John F. Darby, Oklahoma independent oil operator, recently gave to Grinnell College at Grinnell, Iowa, a 31-acre royalty interest under a 4,428-acre tract in Crockett County of West Texas.

E. S. Miles, production department, Phillips Petroleum Co., has been promoted from engineer, Smackover, Ark., district, to Big Spring district engineer, with offices in Odessa, Tex. **F. W. Shelton,** northern division superintendent for Phillips, has moved his headquarters from Great Bend to Wichita. Other personnel affected include: **W. L. Kitsman,** assistant division superintendent, and **F. L. Riggs,** division chief clerk.

W. B. Buck, formerly West Edmond district superintendent for Phillips Petroleum Co., has been named superintendent of the newly formed Guthrie district, which include the Billings-Stillwater area. Other personnel affected include: **Clayton Johnson,** formerly West Edmond district engineer, and now Ardmore district engineer; and **J. M. Boxell,** formerly West Edmond maintenance foreman, and now Guthrie district engineer.

Rep. Lyndon B. Johnson of Austin, and **Rep. Paul Kilday** of San Antonio, have been named to a five-man congressional armed-services subcommittee to investigate present and future petroleum supplies, with emphasis on requirements of the armed forces.

D. J. Hoose, New York manager, industrial relations, refining department of The Texas Co., recently presented to **E. M. Reynolds,** plant superintendent, the American Petroleum Institute's million-man-hour certificate and the National Safety Council's distinguished-service award for safety, for the West Tulsa refinery's record of over 1,253,000 man-hours of operation without a disabling accident.

Harvey A. Heller, independent Oklahoma oil operator, has been elected president of the Tulsa Chamber of Commerce for the coming year. **W. B. Way,** general manager of the International Petroleum Exposition to be held in Tulsa, was elected first vice president.

John R. Suman, vice president of Standard Oil Co. of New Jersey, spoke before the Petroleum Engineering Club of Texas A. & M. College at their recent meeting. Suman spoke on the "Advisability and Opportunities for the College Engineering Graduate Going Into Foreign Work."

J. A. McCutchin, with Sohio Petroleum Co., has been elected chairman of the Illinois Basin production chapter of the American Petroleum Institute. **Ed Stapp** has been named first vice chairman; **Don Rounds,** second vice chairman; and **H. W. Bodkins,** secretary-treasurer.

Philip Boyle, formerly with Skelly Oil Co. at Shreveport, has joined the geological staff of Eason Oil Co., Oklahoma City.

Dr. Charles F. Fryling, who heads a division of rubber research, Phillips Petroleum Co., has been elected chairman of the Panhandle Plains section of the American Chemical Society at Amarillo.

W. H. Schluneger, district geologist for Atlantic Refining Co. in northern Oklahoma and Panhandle of Texas region, has resigned to become a consulting geologist in Tulsa.

Eugene F. McCabe, general sales manager, eastern division sales department, Tide Water Associated Oil Co., has been named vice president. He will continue in charge of sales.

Arthur E. Bone, vice president and general manager of Eastern Shore Gas Corp., a wholly owned subsidiary of Suburban Propane Gas Corp., has been appointed assistant to the president of the parent company whose main offices are in Whippany, N. J. Since 1936 Bone has been employed by Philgas division of Phillips Petroleum Co. in various sales, operating, and executive capacities. Following his war service Bone was a technical adviser of Phillips Petroleum Co., assigned to Suburban Propane Gas Corp.

James Kisling, formerly with Amerada Petroleum Corp., and **A. B. Rowley,** former consulting geologist, Tulsa, are in the geological department of the Sinclair Oil Corp. at Addis Ababa, Ethiopia.

K. Marshall Fagin, of The Petroleum Engineer, has been elected president of the Petroleum Engineers Club of Dallas for the coming year. Other officers elected include: **Henry J. Gruy,** DeGolyer & MacNaughton, first vice president in charge of programs; and **John R. Coombs,** Magnolia Petroleum Co., second vice president in charge of arrangements. Re-elected were **Charles D. Deschner,** Continental Supply Co., third vice president in charge of membership, and secretary-treasurer **Ralph U. Maddox,** Big West Drilling Co.

Ira H. Cram, assistant chief geologist for Pure Oil Co., has been appointed manager of exploration, a newly created position in the company's production executive department. Cram has been with Pure for 23 years holding various positions in the geological department.

Don L. Connelly, who is in charge of Gulf Coast operations for Warren Petroleum Corp. with his headquarters in Houston, has been named to succeed **John H. Boyle** as officer in charge of the corporation's oil and gas producing operations. Prior to joining Warren Connelly was with Cities Service Oil Co. Boyle has resigned effective January 1, to join **E. I. Hanlon** in the organization of Hanlon-Boyle, Inc. **M. F. Waters,** formerly president of Hanlon-Waters, Inc., and more recently engaged in

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developing crude-oil production in Illinois, will also join the new company which will have offices in Tulsa.

A. E. Cheney of Sinclair Prairie Oil Co., has been elected to the board of directors of the Kansas Geological Society.

T. S. Bacon, chief engineer for Lone Star Producing Co., Dallas, has been reelected chairman of the corrosion research project committee of the Natural Gas Association of America. **M. E. Holmberg,** Phillips Petroleum Co., Bartlesville, Okla., is vice chairman.

E. D. Bates, production superintendent for Ashland Oil & Refining Co., has resigned to become a consultant in oil field inventories, with headquarters in Tulsa.

Ralph S. Orme, formerly gas engineer on rate cases and more recently engineer on gas certificate dockets for the Federal Power Commission, has resigned to enter the pipe-line-construction business in Texas.

Zohar Ramon del Campo, an Argentine consular officer, is scheduled to become Argentine consul in Houston in January. His work will be largely in connection with the growing export trade of oil-industry equipment and other industrial machinery from the Texas Gulf Coast area.

E. D. Brockett, Jr., assistant chief petroleum engineer, and **N. C. Simpson,** zone petroleum engineer at Odessa, Tex., in the production department of the Fort Worth district of Gulf Oil Corp., have been promoted to assistant superintendents of production. Other promotions in the district include: **R. J. Holley,** assistant zone petroleum engineer at Odessa, who was named assistant chief petroleum engineer and transferred to Fort Worth; and **C. B. Hussey,** field petroleum engineer at Kermit, Tex., who was promoted to zone petroleum engineer and moved to Odessa. **O. C. Needham,** assistant superintendent of production for Gulf, will retire March 1.

Stanley Wilcox, of Seismograph Service Corp., has returned to Tulsa after several months in Venezuela where his company is making a survey of water resources in the sparsely settled regions of Eastern and Southern Venezuela. He described his trip to the Tulsa Nomads chapter, of which he is president, showing colored slides and movies taken of this little-known area, including the fabulous Gran Sabana, the mile-high gorge of the Auyan Tepui plateau, and Angel Falls.

C. M. Langford, proration engineer, Phillips Petroleum Co., has been transferred from southern region office, Houston, to general headquarters in Bartlesville. Other recent moves in the production department include: **Edward H. Casey,** engineer trainee, North Burbank district, Kaw, Okla., to Panhandle district, Borger, Tex.; **David Lindsay Hume,** engineer, Bartlesville office to Philtex division, Ponca City; **H. Dell Redding,** engineer trainee, western division to Drilling Tools Division, Odessa; and **Cecil W. Henson,** engineer trainee, eastern Kansas district, Eureka, to West Texas area, Odessa.

D. A. Hulcy, president, Lone Star Gas Co., has been reelected to his second term as president of the Dallas Chamber of Commerce.

SHIFTS—

Fred E. Hummel, engineer, Shell Oil Co., Inc., Bakersfield to Ojai, Calif.; **John R. Gignoux,** engineer Shell Oil Co., Inc., Los Angeles to San Gabriel, Calif.; **H. V. Copeland, Jr.,** geologist, Magnolia Petroleum Co., Cuba to Aztec, N. M.; **Robert H. Barnes,** foreman, General Geophysical Co., Hamlin, Tex., to Haynesville, La.; **Charles R. Burney,** engineer, J. S. Abercrombie Co., West Columbia to Sweeny, Tex.

C. L. Cooksey, superintendent, Carter Oil Co., Plaquemines, La., to Denver, Colo.; **W. S. Hill,** engineer, Union Producing Co., Houma, La., to Agua Dulce, Tex.; **Paul Johnson,** foreman, Continental Oil Co., Jennings, La., to Conroe, Tex.; **George V. Cooper,** superintendent, Cities Service Refining Corp., Maplewood to Sulphur, La.; **Earl S. Lougee,** engineer, Barnsdall Oil Co., Victoria, Tex., to Tulsa; **J. R. Patterson,** engineer, Shell Oil Co., Inc., Kilgore to Atlanta, Tex.; **R. C. McCay,** engineer, The Texas Co., Sunburst, Mont., to Port Arthur, Tex.; **R. L. Kretz,** geologist, The California Co., Laramie, Wyo., to Wichita, Kans.; **E. A. Renfro,** superintendent, Stanolind Oil & Gas Co., Tulsa to Houston, Tex.; **E. C. Swenson,** superintendent, Nicklos Drilling Co., Anahuac to Beaumont, Tex.

C. D. Winkleman, superintendent, Shell Pipe Line Corp., Houston, Tex., to Cushing, Okla.; **R. A. Van Nordstrand,** chemist, Sinclair Refining Co., Chicago to Flossmoor, Ill.; **W. H. Whetzel,** foreman, Cities Service Oil Co., Frederick to Walters, Okla.; **C. D. Rogers,** superintendent, Cities Service Gas Co., Bartlesville, Okla., to Wichita, Kans.; **R. C. Schorlemmer,** superintendent, The Texas Co., Tulsa to Port Neches, Tex.

DEATHS

Judge Nathan Ross Margold, solicitor of the Interior Department from 1933 to 1942 and one-time chairman of the Petroleum Administrative Board and of the labor policy board of the oil industry, died unexpectedly December 16 at his home in Washington. For the past 5 years he had been a member of the District of Columbia Municipal Court bench.

Gordon L. Scheig, 47, independent oil operator in Texas and Oklahoma, died December 20 in San Antonio. A native of Oklahoma Scheig moved to San Antonio in 1936 where he became affiliated with his brother in the oil operating and leasing business.

Harold D. Lanhon, 78, early-day independent oil operator of Oklahoma, died December 22 in Tulsa.

R. D. Watkins, 35, geophysical engineer with Superior Oil Co. in Houston, was found dead December 21 in Houston.

A. W. Plant, 56, formerly division manager for Phillips Petroleum Co., died December 17 in Tulsa.

J. Arthur Young, 59, petroleum engineer for The Texas Co., died December 16 in Sapulpa, Okla.

Noel Leslie Kelley, 57, Midland, Tex., oil operator, died December 13 in Dallas.

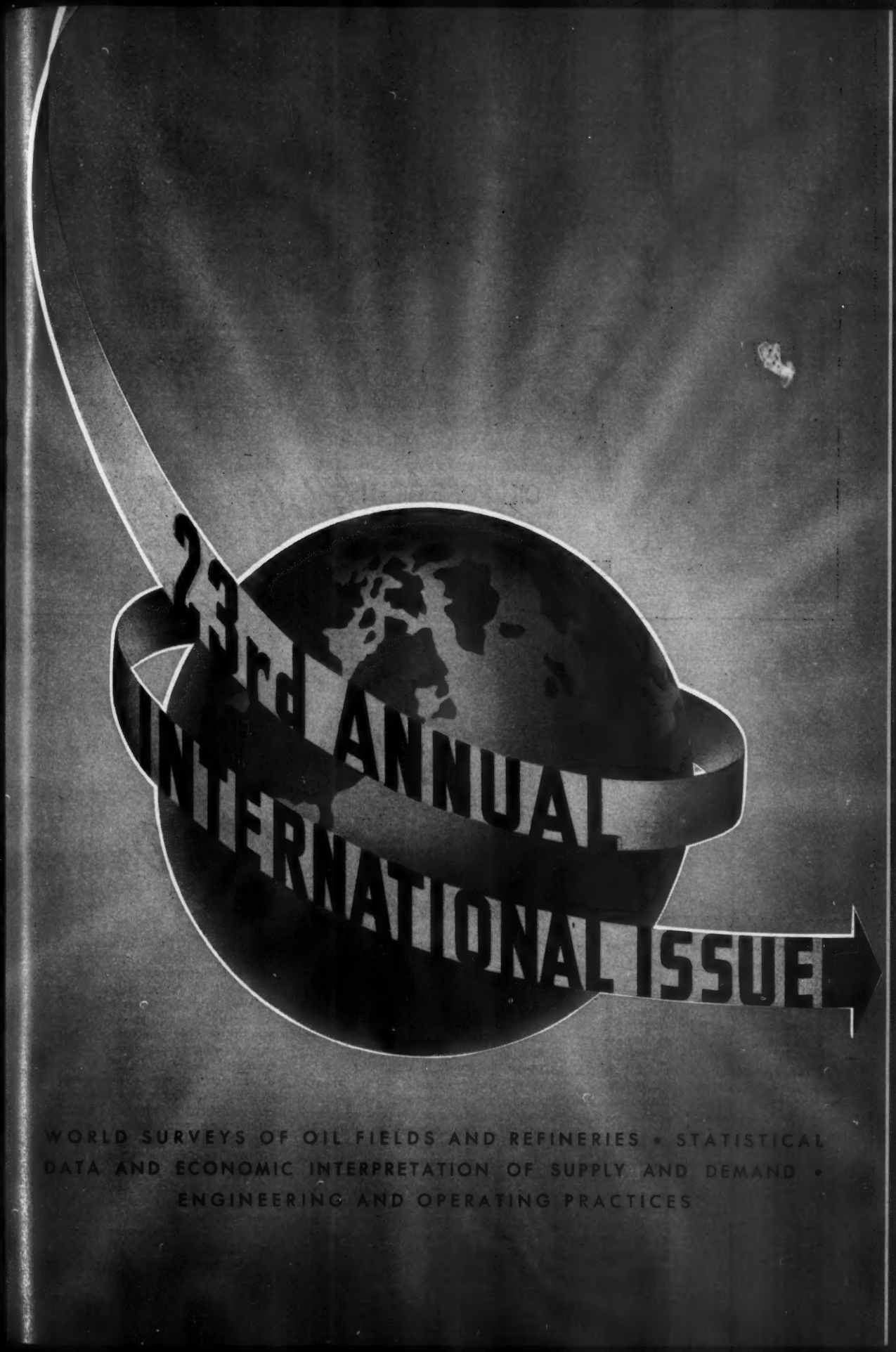
H. Ford Witherspoon, 62, secretary of Witherspoon Oil Co. and Chiquita Oil Co., died December 17 in San Antonio.

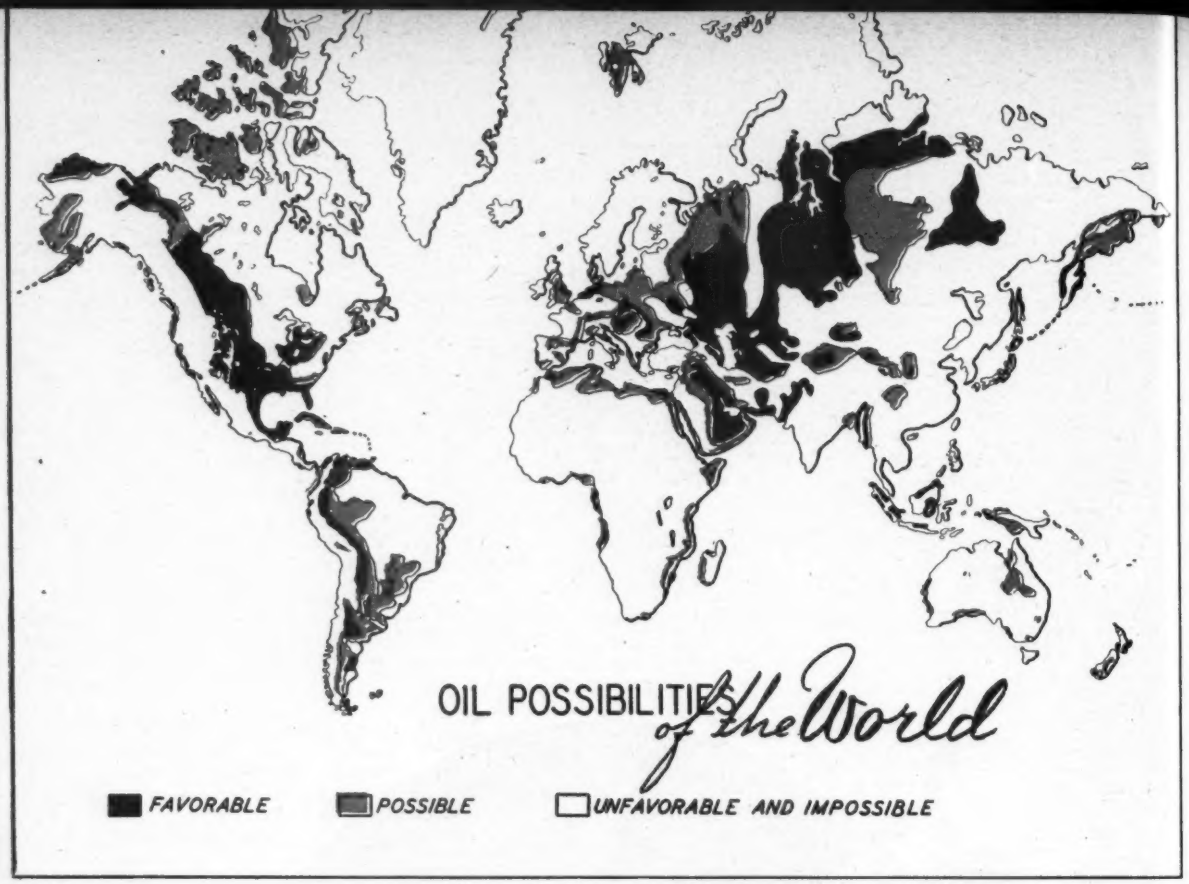
Harry R. Hollenback, 39, Oklahoma independent oil operator, died December 20 in Oklahoma City.

Clinton Clemmens Steinberger, Sr., 68, Oklahoma and Texas independent oil operator, died December 16 in Houston.

Horace H. Jorgensen, 46, credit manager for Derby Oil Co., Wichita, died December 21 in Wichita.

Nicholas Tomlinson, 85, formerly with Petrolia Corp. and one of the pioneer Canadian drillers in Nigeria, died recently at Forest, Ont.


23rd ANNUAL
INTERNATIONAL ISSUE
WORLD SURVEYS OF OIL FIELDS AND REFINERIES • STATISTICAL DATA AND ECONOMIC INTERPRETATION OF SUPPLY AND DEMAND • ENGINEERING AND OPERATING PRACTICES



Production UP Sharply

In Response to World Demand

by Warren W. Burns

CRUDE-OIL production outside the United States and Soviet Union increased 14.4 per cent during 1947, with every producing region of the world straining to make up for the wartime lag in development.

Under the stimulus of expanding demands everywhere, exploration, drilling, and development also reached new peaks of activity which promise to lift crude output in these same areas to 3,000,000 bbl. per day within another year.

The average daily production of all foreign countries during 1947 is estimated by The Oil and Gas Journal at 2,657,000 bbl. This is a gain of 329,000 bbl. per day over the production in 1946, and is 71.7 per cent over 1938 output. These figures do not include production within Russia, where no information is obtainable.

The daily averages for the year do not tell the whole story of the production increase, for the curve is definitely upward. New fields discovered and extensive development drilling and transportation projects put current output above the annual average in many important areas and promise to keep it climbing.

Chief deterrents to a far greater increase in production are political uncertainties and shortages of equipment, but the paramount need for oil is overcoming these obstacles. Despite the varied demands on steel and the needs for other commodities, most producing countries are giving the right-of-way to production and importation of oil-industry equipment.

Political disturbances held back rehabilitation of fields and refineries in the Netherlands East Indies and other parts of the Far East, but there is now promise of rapid progress. In most of Europe the problems of reconstruction and political troubles delayed expansion. In much of Latin America the spirit of nationalism precludes the operation of private capital which has developed virtually all of the world's oil to date, but there, too, progress is being made. In the Near East a new political cloud arises over the Moslem world's dissatisfaction with the United Nations plan for Palestine. But the foreign oil policy of the United States is clearer and firmer than in many years, giving encouragement to American operators to expand their foreign production and exploration in every part of the world open to private enterprise.

The Middle East holds the center

of attention, and last year contributed more than half of the increase in the world's total output, producing, on the average, 858,000 bbl. per day, an increase of 22.4 per cent over 1946 and 161.4 per cent over 1938. The relatively few wells already drilled in this prolific area average some 4,000 bbl. per day each compared with about 12 bbl. per day per well in the United States. The production potentials of the Middle East are being built up rapidly, and during 1947 plans were perfected for new pipe lines to the Mediterranean which will permit actual output to rise at an even faster rate than at present.

With most other oil areas of the Old World still not recovered from the war, notably the East Indies, it was the output of the Middle East which was largely responsible for the 1947 daily average production of 1,073,400 bbl. for the entire Eastern Hemisphere (exclusive of Soviet areas). This exceeded the 1946 average by 179,000 bbl. daily, an increase of 20.1 per cent—a somewhat greater actual increase and a much larger percentage gain than the other half of the world.

By comparison, the Western Hemisphere, outside the United States, had an average daily production during 1947 of 1,583,600 bbl., an increase over 1946 of 159,700 bbl., or 10.4 per cent.

This performance bears out predictions that the Eastern Hemisphere as a whole may become self-sufficient in petroleum within a few years. It has been estimated that by 1960 foreign oil production (exclusive of Russia) will be about 4,637,000 bbl. daily, divided 1,815,000 bbl. from the Western Hemisphere and 2,822,000 bbl. from the Eastern Hemisphere, with the Middle East producing some 2,250,000 bbl. of this.

But in spite of the interest in the Middle East, Venezuela remains the largest oil-producing nation of the world, outside of the United States, and the current activity there bids fair for it to remain so. Its producing wells average nearly 240 bbl. per day each, and together they poured out an average of 1,187,000 bbl. every day last year, an increase of 11.5 per cent over 1946. Wildcatting, development drilling, and construction of pipe lines, docks, and refineries are proceeding rapidly in old and new oil regions of the country.

Exploration at High Level

Throughout the world exploratory work is at a high level. North of the Arctic Circle the United States Government is drilling for oil in Alaska, while at the bottom of the world the Chilean Government is developing a promising discovery in Terre Del Fuego. In Colombia the highest well in the world is boring beneath the Andes from an elevation of 8,000 ft., while seismograph work is under way on the bottom of the ocean off the Bahamas Islands.

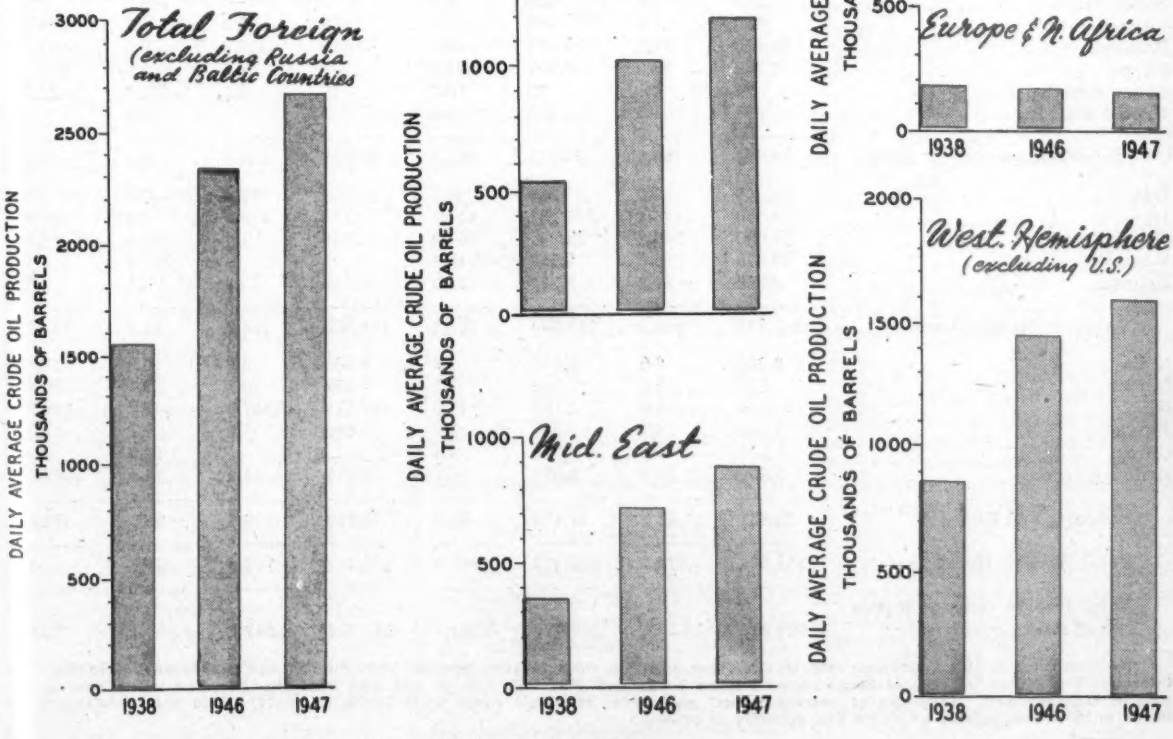
New fields were found last year in such widely scattered places as western Canada, French Morocco, southern Venezuela, central Bolivia, and Saudi Arabia.

The search is on in countries which have not produced a barrel of oil to date, including Denmark, Sweden, Ethiopia, Australia, New Zealand, Spain, Portugal, Turkey, Cyprus, the Levant, Sicily, Panama, Nicaragua, Paraguay, and the Philippine Islands. Such small producers as France, Germany, England, Brazil, China, and Japan also are pushing exploration.

The relative positions of the oil-producing countries and regions of the world are shown in the table on page 156, which compares performance with 1946 and also with 1938, the last full prewar year.

From this table it can be seen, for example, that while the Netherlands East Indies tripled its production and made much progress in rehabilitating war damage in spite of political disturbances which held back all industrial activity, the output of the entire Far East is still 70 per cent below the prewar level.

In all of Europe and North Africa the crude production was only 152,800



World crude-oil production by areas

bbl. per day, which was 5.3 per cent less than 1946 and 6.9 per cent below prewar. The area's largest producers all showed declines, and the countries with large percentage increases account for only a small amount of crude in total. Most of these countries planned intensive exploratory campaigns, meanwhile making progress in rehabilitating refining facilities to prepare for increasing importations of foreign crude.

Other highlights of the year's production activities scattered around the world include:

ARGENTINA produced at the rate of 59,000 bbl. per day, an increase of 3.7 per cent over 1946. With two-thirds of the industry government owned and the political climate adverse to expansion of private investments, the country's production failed to meet domestic demands, and substantial imports were required.

BOLIVIA, where the entire oil industry is in the hands of the government, held its production at 1,000 bbl. per day, all in areas remote from

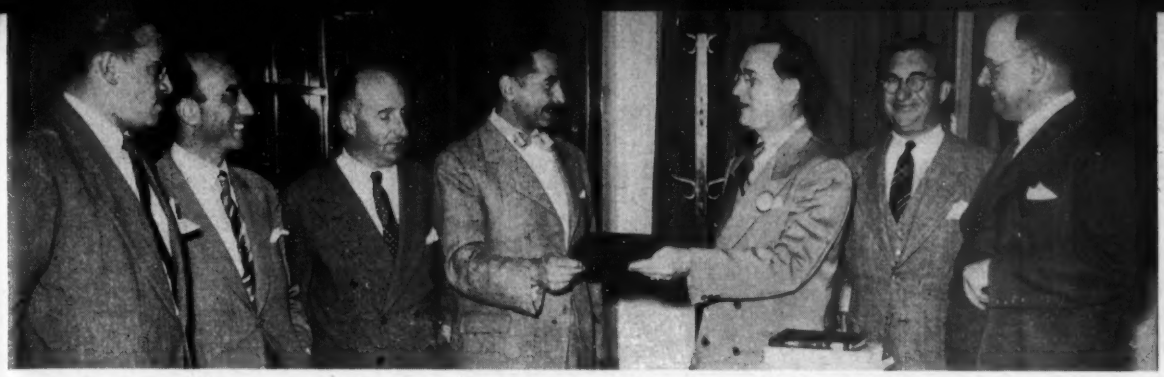
FOREIGN CRUDE PRODUCTION†

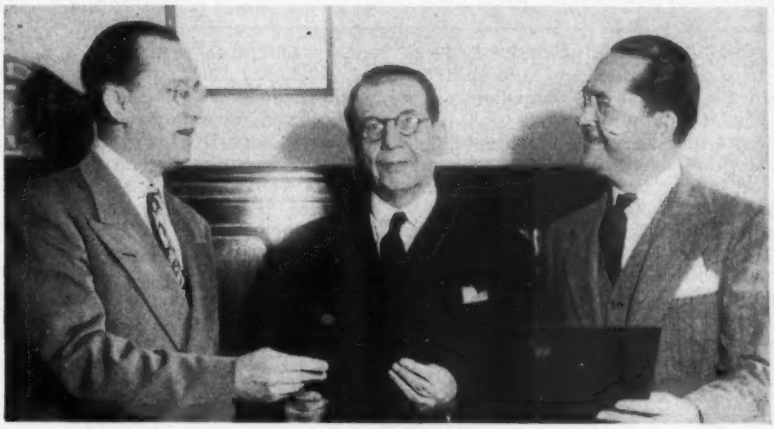
(EXCLUSIVE OF RUSSIA AND BALTIC COUNTRIES)‡

(Thousands of barrels)

	1947 (estimated)		1946		1938		Percentage inc.	
	Yearly total	Daily average	Yearly total	Daily average	Yearly total	Daily average	1947 over 1946	1947 over 1938
Argentina	21,535	59.0	20,769	56.9	17,076	46.8	3.7	26.1
Bolivia	365	1.0	365	1.0	226	0.6	...	61.5
Brazil	109	0.3	73	0.2	.....	...	50.0	(*)
Canada	6,935	19.0	7,154	19.6	6,966	19.1	—3.1	—0.4
Colombia	24,966	68.4	22,119	60.6	21,582	59.1	12.9	15.7
Cuba	219	0.6	219	0.6	.....	...	...	(*)
Ecuador	2,300	6.3	2,372	6.5	2,246	6.2	—3.0	2.4
Mexico	56,575	155.0	49,056	134.4	38,506	105.5	15.3	46.9
Peru	12,775	35.0	12,483	34.2	15,839	43.4	2.3	—19.3
Trinidad	18,980	52.0	20,221	55.4	17,737	48.6	—6.1	7.0
Venezuela	433,255	1,187.0	388,543	1,064.5	188,174	515.5	11.5	130.2
Total Western Hemisphere (exclusive of United States)	578,014	1,583.6	523,374	1,433.9	308,352	844.8	10.4	87.4
Albania	365	1.0	365	1.0	752	2.1	...	—51.5
Austria	5,475	15.0	5,658	15.5	383	1.0	—3.2	1,329.5
Czechoslovakia	200	0.6	183	0.5	130	0.4	9.3	53.8
France	385	1.0	365	1.0	513	1.4	5.5	—25.0
Germany	4,315	11.8	4,526	12.4	3,861	10.6	—4.7	11.8
Hungary	4,700	12.9	5,147	14.1	288	0.8	—8.7	1,531.9
Italy	73	0.2	36	0.1	101	0.3	102.8	—27.7
Jugoslavia	365	1.0	365	1.0	.....	...	...	(*)
Netherlands	1,300	3.6	438	1.2	.....	...	196.8	(*)
Poland	960	2.6	949	2.6	3,763	10.3	1.2	—74.5
Romania	28,470	78.0	31,463	86.2	48,487	132.8	—9.5	—41.3
Egypt	8,760	24.0	8,943	24.5	1,581	4.3	—2.0	454.1
Other Africa	21	0.1	73	0.2	27	0.1	—71.2	—22.2
United Kingdom	385	1.0	402	1.1	.....	...	—4.2	(*)
Total Europe and N. Africa	55,774	152.8	58,913	161.4	59,886	164.1	—5.3	—6.9
Iraq	35,040	96.0	35,296	96.7	32,643	89.4	—0.7	7.3
Iran	159,300	436.4	146,402	401.1	78,372	214.7	8.8	103.3
Saudi Arabia	90,000	246.6	60,298	165.2	495	1.4	49.3	18,081.8
Kuwait	20,075	55.0	5,950	16.3	.....	...	237.4	(*)
Bahrein	8,760	24.0	7,994	21.9	8,298	22.7	9.6	5.6
Subtotal Middle East	313,175	858.0	255,940	701.2	119,808	328.2	22.4	161.4
India	2,920	8.0	2,555	7.0	2,488	6.8	14.3	17.4
Burma	730	2.0	565	1.5	7,538	20.7	29.2	—90.3
N.E.I.	13,000	35.6	4,197	11.5	57,318	157.0	209.7	—77.3
Japan	1,460	4.0	1,351	3.7	2,511	6.9	8.1	—41.9
China	1,095	3.0	730	2.0	.....	...	50.0	(*)
British Borneo	3,650	10.0	2,081	5.7	6,913	18.9	75.4	—47.2
Subtotal Far East	22,855	62.6	11,479	31.4	76,768	210.3	99.1	—70.2
Total Eastern Hemisphere	391,804	1,073.4	326,332	894.0	256,462	702.6	20.1	52.8
Total foreign (exc. of Russia and Baltic countries)	969,818	2,657.0	849,706	2,327.9	564,814	1,547.4	14.1	71.7

*No production in 1938. †Sources: 1938, U. S. Bureau of Mines; 1946, industry sources; 1947, The Oil and Gas Journal estimates. ‡No information available. Bureau of Mines shows Russian production 204,956 000 bbl. in 1938, and Sakhalin (Far East island now in possession of U.S.S.R.) 3,861. Estimates of current annual production in Russia range from 200,000,000 to 600,000,000 bbl. Sakhalin is believed to be producing about 6,000,000 bbl. annually at present.





Staff members of The Oil and Gas Journal and its Latin-American affiliate, Petroleo Interamericano, visited many fields and oil-operating centers outside the United States during 1947. O. B. Irizarry, editor of the latter publication, returned early this month from a 20,000-mile trip to South America, where he gathered first-hand information for the two magazines, and also represented the International Petroleum Exposition. He extended official invitations from W. G. Skelly, president of the exposition, and Gov. Roy J. Turner of Oklahoma, to oil companies and government officials throughout South America. In the cut at top of page Dr. Irizarry (third from left) is shown delivering an invitation to the administrative staff of A.N.C.A.P., at Montevideo, Uruguay. Included in the group are C. Garcia Brunel, J. C. Abraira, J. C. Margenat, E. Perez Prins, Julio Paporte, and Dr. R. Deambrosis. In the other cut, Dr. Irizarry, at left, extends invitations to Dr. T. E. Tascon, minister of mines and petroleum of Colombia, and Dr. Felix Mendoza, president of the National Petroleum Congress of Colombia

population centers, but drilling was resumed, a new field discovered, and progress made on a pipe line and refinery to utilize the production and permit it to increase.

BRAZIL considered, but did not enact, a new petroleum law to permit the entrance of private industry, meanwhile doing some drilling in its small fields which increased the production rate to 300 bbl. per day, which was above the capacity to transport crude to the refineries.

COLOMBIA, Latin America's third largest producing country, boosted production by 12.9 per cent to 68,400 bbl. per day. A new petroleum law facilitated development, and there is considerable exploratory work in several areas.

MEXICO continued to increase its crude output, which fell off sharply when the industry was nationalized in 1936, and reached 155,000 bbl. per day, an increase of 15.3 per cent during the year. This was not considered satisfactory, and the Mexican Government sought contracts with United States drillers and pondered changes in its petroleum law which would invite venture capital.

VENEZUELA, world's largest producer outside of the United States, continued its steady progress, and its 1947 daily average of 1,187,000 bbl. per day was 11.5 per cent over 1946. Important new discoveries were made in the Lake Maracaibo region and the newer Eastern areas, as well as promising tests in other sections, and pipeline and refinery construction was being expanded rapidly to keep pace.

IRAQ, oldest Middle East producer, dropped off very slightly to an average of 96,000 bbl. daily, but projects for new drilling and another pipe line to the Mediterranean promised to reverse this decline within a couple of years.

IRAN, which still accounts for nearly half the Middle East output, increased production by 8.8 per cent, reaching 436,400 bbl. daily. Activity toward the close of the year indicated that this figure would be substantially higher in 1948.

SAUDI ARABIA made the impressive gain of 49.3 per cent, producing a daily average of 246,600 bbl. daily. Discovery of Buqqa, which may prove to be one of the world's very large fields, and continued development of other fields kept the output potential rising rapidly, but production at full capacity awaits completion of the 1,040-mile 30 and 31-in. pipe line to Lebanon on the Mediterranean which was started late in 1947.

To keep pace with the expanding production, more than 6,000 miles of pipe-line construction was started or projected during 1947 for areas outside the United States and Russia, chiefly in the Middle East and South America.

In addition to rehabilitation of war-damaged refineries, which is now nearing completion, plans were drawn during 1947 for the construction of new refineries which will increase the world's capacity (outside of the United States and U.S.S.R.) by between 600,000 and 900,000 bbl. per day within the next 3 years. With the refinery capacity in these areas now slightly more than 3,000,000 bbl. crude throughput per day, it is estimated that the capacity will be in the neighborhood of 4,000,000 bbl. per day by 1951.

In spite of this rapid expansion in its capacity, the world's oil industry still faces a huge task in supplying the world's markets. Demand everywhere is increasing rapidly, and it is estimated that the percentage of increase during the next 3 years will be as great as during either of the last two decades. The forecasts for virtually every part of the world are for large increases in the per-capita consumption of all types of petroleum products, and it is estimated that total world demand (exclusive of Russia), now at about 8,093,000 bbl. daily, will be close to 10,000,000 bbl. daily by 1951.

ANNUAL SURVEYS

The Journal's annual survey of world oil fields outside the United States starts on page 171 of this issue. The annual refinery survey starts on page 200.

WORLD OIL INDUSTRY MUST PREPARE FOR DEMAND OF NEARLY

10,000,000 bbl. by 1951

by J. A. Cogan

THE international oil industry faces a major challenge to supply the world's needs in the immediate years ahead. Oil-supply facilities in all parts of the globe are, practically without exception, being pushed to their utmost to pour forth the astonishing record volume of liquid energy demanded today on a world-wide scale. And still the world clamors for more and more petroleum to furnish added energy. Energy that stands behind production, that makes possible freedom of movement, that keeps us warm, energy sought so eagerly as a basis for restoring and improving the world's standard of living.

The predominant position of the United States as a petroleum consuming and producing country is, of course, well known. Just how predominant is strikingly shown by a summary comparison of demand, production and reserves of petroleum for major world-wide areas, both on a total volume and per capita basis, as shown in Table 1.

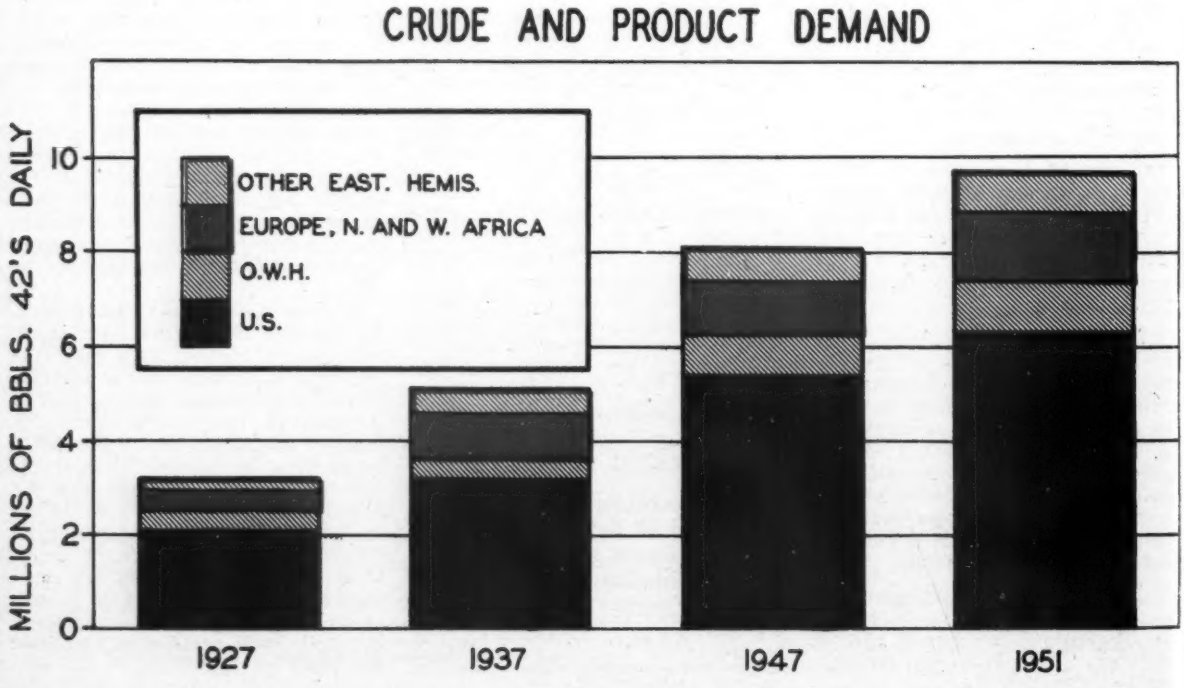
Several significant relations are ap-

TABLE 1—COMPARISON OF WORLD DEMAND, PRODUCTION, AND RESERVES, EXCLUDING RUSSIA

Estimated 1947 volumes:	United States	Other W. Hem.	Europe, N. and W. Africa	Other Hem., ex. Russia*	Total world, ex. Russia*
Demand, thou. bbl. per day	5,427	906	1,096	664	8,093
Production, thou. bbl. per day	5,431	1,584	193	906	8,114
Proved reserves, 1-1-47, million bbl.	21,422	8,896	754	22,150	53,222
Estimated 1947 bbl. per capita:					
Demand	13.9	2.1	0.8	0.2	1.4
Production	13.9	3.6	0.2	0.3	1.4
Proved reserves, 1-1-47	150.1	55.3	1.6	17.0	25.6

*Unsatisfactory statistical data make it advisable to exclude Russia. The best guess as to Russia's probable current petroleum demand is about 550,000 bbl. per day or 1.0 bbl. per year per capita. Proved reserves are estimated at about 6.3 billion barrels.

Jerry A. Cogan was appointed to head the coordination and economics department of Standard Oil Co. (N. J.) August 5, 1947, succeeding Howard W. Page. Cogan was born July 29, 1910, in Canon City, Colo. He was graduated from Colorado College in 1930 and received a master of science degree from Massachusetts Institute of Technology 2 years later. Joining Standard Oil Co. of Louisiana, a Jersey affiliate, in 1932, Cogan worked as a process engineer in the Baton Rouge refinery before coming to New York in 1934 to become a member of Jersey's coordination manufacturing group which was taken over by the coordination and economics department. He was on a leave of absence from 1942 until late in 1945 with PIWC and then with PAW where he later became associate director of PAW's program division.



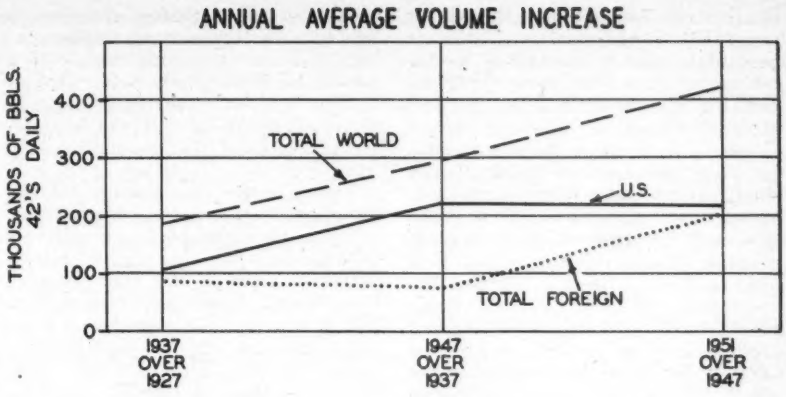
parent from an examination of Table 1. First is the basis for the often-quoted statement that the United States is today producing and using petroleum at a rate twice as high as all the rest of the world (excluding Russia) while at the same time it has only 40 per cent of the proved reserves (excluding Russia). Of equal interest is the fact that on a per-capita basis, petroleum demand in the United States is from 7 to 70 times as high as in other major areas.

It is clear that a great potential increase in petroleum demand and supply activities lies in the international field; probably potentially much greater than in the United States. The task of the industry in the years that lie ahead will be shaped by the total size of the growth of demand. But the nature of that task will also be conditioned by the comparative rates of growth in demand in different parts of the world and by the changing pattern of demand among products.

Petroleum Demands

Something of possible future trends in demands can be seen from an examination of the past.

The growth of world-wide petroleum demands over the past 10 to 20 years and estimates for the next 4-year period are shown in Table 2 and illustrated in an accompanying chart.



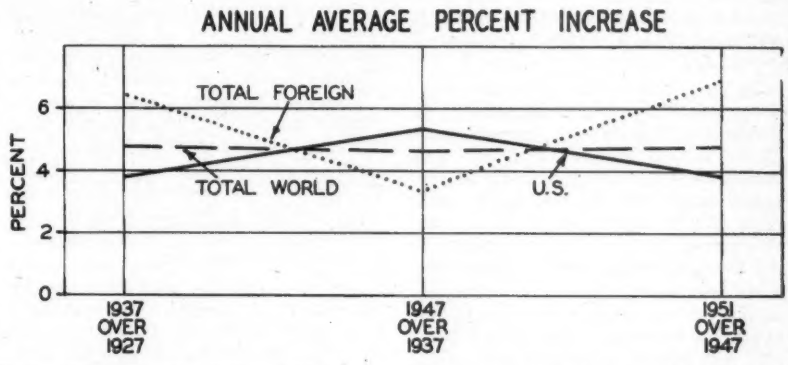
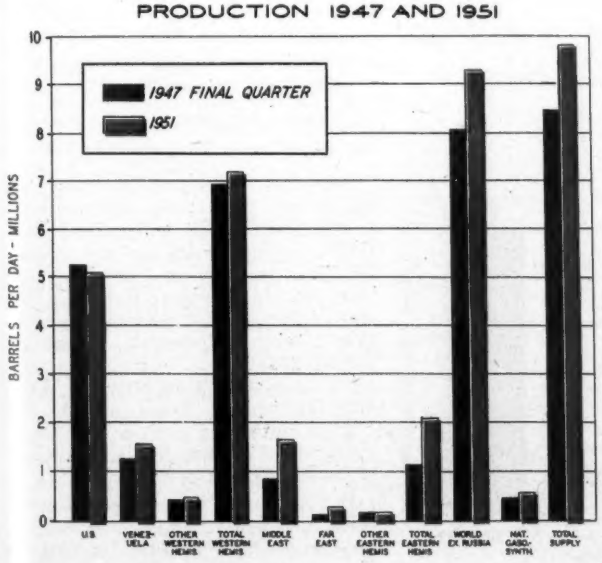
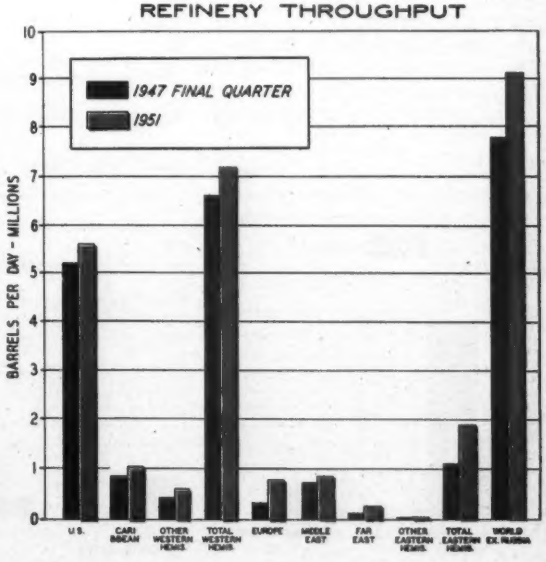


TABLE 2—WORLD CRUDE AND PRODUCTS DEMAND (EXCLUDING RUSSIA)
(Thousands of barrels daily)

	United States	Other W. Hem.	Europe, N and W. Africa	Other E. Hem.	Total Foreign	Total world
1927	2,198	320	448	251	1,019	3,217
1937	3,205	491	969	440	1,900	5,105
1947	5,427	906	1,096	664	2,666	8,093
1951	6,300	1,112	1,577	792	3,481	9,781
Annual average volume increase:						
1937 over 1927	100.7	17.1	52.1	18.9	88.1	188.8
1947 over 1937	222.2	41.5	12.7	22.4	76.6	298.8
1951 over 1947	218.3	51.5	120.3	32.0	203.8	422.0
Annual average per cent increase:						
1937 over 1927	3.8	4.4	8.0	5.8	6.4	4.8
1947 over 1937	5.4	6.3	1.2	4.2	3.4	4.7
1951 over 1947	3.8	5.3	9.5	4.5	6.9	4.8

Although a remarkable stability appears in the annual average percentage rate of increase for world-wide crude and products demand, when the decade 1927-1937 is compared with the decade 1937-1947 and with the 4 years 1947-1951, it should be noted that the average annual volumetric increase, which was slightly under 200,000 bbl. per day in the 1927-1937 decade and slightly under 300,000 bbl. per day in the 1937-1947 decade, is expected to exceed 400,000





bbl. per day average over the next 4 years. It is significant that the same percentage rate of increase in world-wide crude and product demands appears to be continuing in the immediate years ahead.

The recently published estimates for requirements in the Marshall plan countries are more than 10 per cent above those included for these countries in the figures of Table 2. Considering, therefore, the world-wide total on a round basis, it appears that the frequently used figure of about 10,000,000 bbl. per day of crude and products demand for 1951 may not be far from the mark, provided adequate supplies are available. Such estimates implicitly assume, of course, that there is no major breakdown in international trade or a major world-wide depression.

In considering the distribution by areas of the anticipated increase in demand, it is interesting to note from Table 2 that despite a lower percentage rate of increase than in foreign areas, the United States will contribute a full one-half of the total volumetric increase. Percentagewise the European increase is most notable.

At the same time that total demands in the United States are expected to increase in excess of 200,000 bbl. per day in each successive year through 1951, the gasoline demands are expected to increase an average of over 90,000 bbl. per day, almost half of the total, with distillate fuels making up nearly an equal volume. This stands in contrast to the estimated distribution in Europe and North Africa where the largest foreign demand increases are expected to occur. There out of a total annual increase of 120,000 bbl. per day, less than a quarter will be made up of annual gasoline increments. By far the largest part (about 70 per cent) of the incremental increases in Europe occur in the fuel oil categories, with the residual fuel increase exceeding that of the distillate fuels. These fuel oil increases reflect, of course, the growing dependence of Europe on oil despite obviously desirable efforts to increase coal supplies.

The continued large volumetric increases in United States and foreign demands and the contrasts in the pattern of product requirements between the United States and abroad present the world industry with difficult supply problems to solve in the immediate years ahead. This is particularly true when these facts are considered alongside of the prospect of a stabilizing of production in the United States and the requirement for large new refining capacity abroad. An examination of some of the high spots of the present supply situation and of the prospective developments from the supply side appears desirable.

Raw Materials

The world petroleum industry at the moment is not in the favorable position it was in the prewar period. There is no surplus potential production today to supply peak or unexpected increases in requirements. Except for the fields of Indonesia from which production is limited because of political conditions, practically every well, if outlet facilities permit, is being produced at its maximum efficient producing rate.

The raw-material supplies of the world, excluding Russia, are expected to average almost 8.1 million barrels per day in the year 1947. Of this, about 400,000 bbl. per day is natural gasoline, benzol, synthetics, etc. Where facilities have permitted, the oil fields of the world have been produced at ever-increasing rates during the year, and in the last quarter of 1947, the output of raw material is expected to be close to 8.5 million barrels per day. This is an annual rate of 3.1 billion barrels.

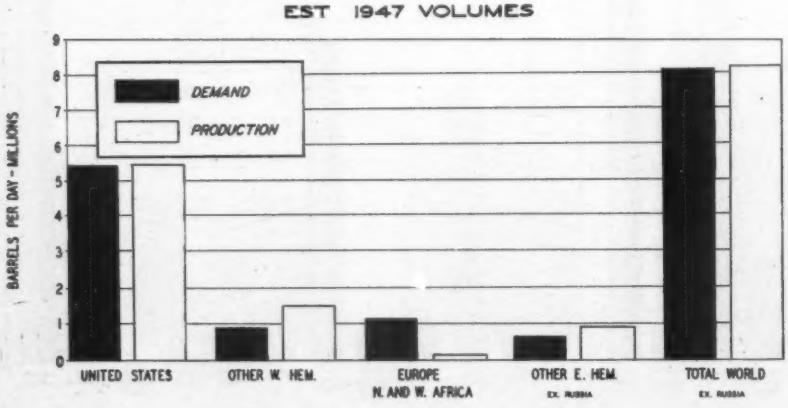
As compared with the full year 1946, the last-quarter production of 1947 is about 1 million barrels per day higher. Of this increase it will be seen that the United States contributed 526,000 bbl. per day, Venezuela 162,000 bbl. per day, and the Middle East 170,000 bbl. per day.

In order to provide the supplies necessary to meet projected demands, the oil fields of the world will be called on in 1951 to produce just under 10,000,000 bbl. per day of crude oil and other raw materials. Where then is this increase over the next 4 years of almost 1.5 million barrels per day above current fourth-quarter 1947 rates to come from?

The remarkable increase accomplished to date in United States production appear to have absorbed essentially all spare efficient productive capacity. A tremendous job is entailed in merely maintaining this productive capacity and the necessary reserves behind it. Thus while additional sizable United States discoveries may be confidently expected, a further sharp rise in the United States productive rate cannot be counted on with any reasonable assurance, and the more probable case would appear to be one with United States crude production stabilized at approximately present levels.

TABLE 3—WORLD CRUDE-OIL PRODUCTION (EXCLUDING RUSSIA)
(Thousands of barrels daily)

	Partly estimated year 1946	Estimated last quarter 1947	Estimated year 1951
United States	4,749.0	5,275.0	5,142.0
Venezuela	1,064.5	1,227.0	1,575.0
Other Western Hemisphere	359.4	404.0	475.0
Total Western Hemisphere	6,172.9	6,906.0	7,192.0
Middle East	701.5	872.0	1,674.0
Far East	25.2	102.0	277.0
Other Eastern Hemisphere	161.0	152.0	152.0
Total Eastern Hemisphere (ex. Russia)	887.7	1,126.0	2,103.0
World, excluding Russia	7,060.6	8,032.0	9,295.0
Natural gasoline, synthetics, etc.	384.0	435.0	521.0
Total supply	7,444.6	8,467.0	9,816.0



Increases in natural-gasoline and condensate production together with a relatively small volume of synthetics should contribute almost 100,000 bbl. per day of increased supplies within 4 years. Rehabilitation and expansion of Far Eastern production, notably in Indonesia, should add 150,000-200,000 bbl. per day to supplies. Increased production in Western Hemisphere areas outside the United States and exclusive of Venezuela should assist to the extent of 50,000-75,000 bbl. per day.

But the major increase of about 1.2 million barrels per day of crude production in 1951 above the last-quarter

1947 rate will presumably have to originate in the two great marginal surplus crude-producing regions of the world, the Venezuelan and Middle East fields. Considering the very high production rate secured per well in these areas, completion of present development plans on schedule should make it perfectly feasible for Venezuela to contribute nearly one-third of this remaining volume and the Middle East fields to fill out the rest.

Production of the requisite raw material obviously will serve no purpose unless adequate provision for and construction of manufacturing capacity go hand in hand.

Refinery Situation

Refineries have demonstrated a remarkable degree of elasticity to date in handling ever-increasing crude supplies with comparatively little new construction. This cannot continue indefinitely, however, and it is now clear that the requirements for new refinery capacity at home and abroad through 1951 will tax the facilities of the equipment manufacturers to the limit.

For the year 1947 United States refineries will average a little over 5 million barrels per day with a last-quarter average approaching 5.3 million barrels per day. Abroad refineries are currently running an estimated 2.5 million barrels per day, as shown in Table 4.

The present refineries, those to be rehabilitated and the publicly announced new plants are expected to increase world-wide runs about 1.6 million barrels per day in the next 4 years above the 1947 average or about 1.3 million barrels per day above current peak rates. Not only is this a colossal task in terms of capital investment, it is a colossal task when viewed in light of present shortages of productive capacity and manpower, in both technically trained and other categories.

Despite this unprecedented task, the oil operators have announced plans, both at home and abroad, by which this capacity might be installed. But it is a race against time. Publicly announced plans for new refinery construction, rehabilitation and known refinery runs, makes it possible to estimate the volume of refinery throughput by broad geographical regions. The estimates for 1951, shown in Table 4, assume, of course, that equipment and manpower will be available as programmed.

In the United States there still remains some backlog of spare refining capacity for which crude oil has not been available. Much of such capacity is either poorly located or in technologically or economically obsolescent. However, use of a portion of this capacity together with planned new construction as revealed in a recent A.P.I. survey should make it possible for United States refineries to handle the estimated 5.6 to 5.7 million barrels per day indicated as necessary in 1951 to cover United States domestic demands and a sharply reduced level of export shipments.

Outside the United States the greatest refinery expansion is anticipated in Europe, the estimated runs in 1951 being well over 400,000 barrels per day above the last quarter estimate for 1947. The 1951 data are approximately the same as used by the C.E.E.C. in their report for the Marshall plan. This increase will be brought about by rehabilitation and extension of the refineries in France, Italy and, to some extent, western Germany, and by the construction of some new refineries as in the United Kingdom and Netherlands to handle the high-sulfur crude of the Middle East fields. The increase of 175,000 bbl. per day shown for the Caribbean area will probably all occur in Venezuela. At the present time, two major refineries are in the early construction phases and other smaller plants, not yet started, may be in operation at the end of the period under review. In other areas of the Western Hemisphere, numerous small new plants and extensions are expected to be in operation—in Canada, Mexico, Chile, Brazil, and Uruguay. Practically all of the increases shown for the Far East represent rehabilitation of present plants with some additions to prewar capacity.

As discussed above, the larger part of the incremental demand on foreign refineries is expected to be for the heavier fuel products. This situation should simplify, somewhat, the type of foreign refinery installations required and make more feasible the stepping up of refinery capacity secured through rehabilitation and bottleneck removal.

The tremendous job to be done to secure added volume of products is such that installations resulting in increased volumes may be expected in most cases to take priority over facilities intended solely for quality improvement.

International Flow and the Transportation Problem

The new oil supplies which will flow in the future international trade are following the general propensity of oil to occur in areas of relatively low consumption with the resultant setting up of a transportation problem.

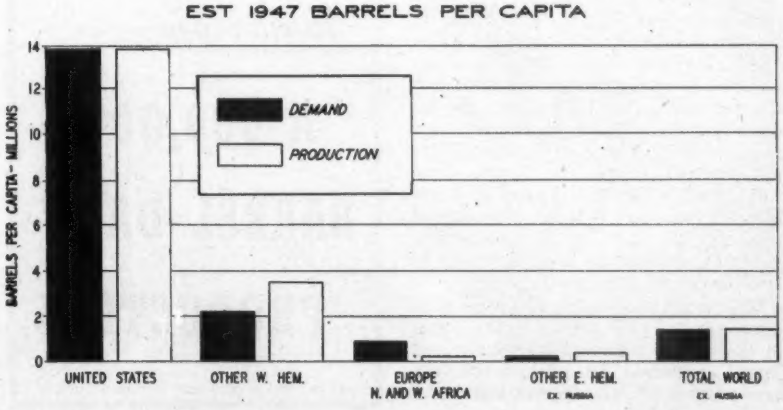
In the light of the estimates discussed above as to location of future increases in demand, production, and refining, it is interesting to consider prospective changes in international flow between the major world-wide regions which may be classed broadly either as surplus or shortage areas.

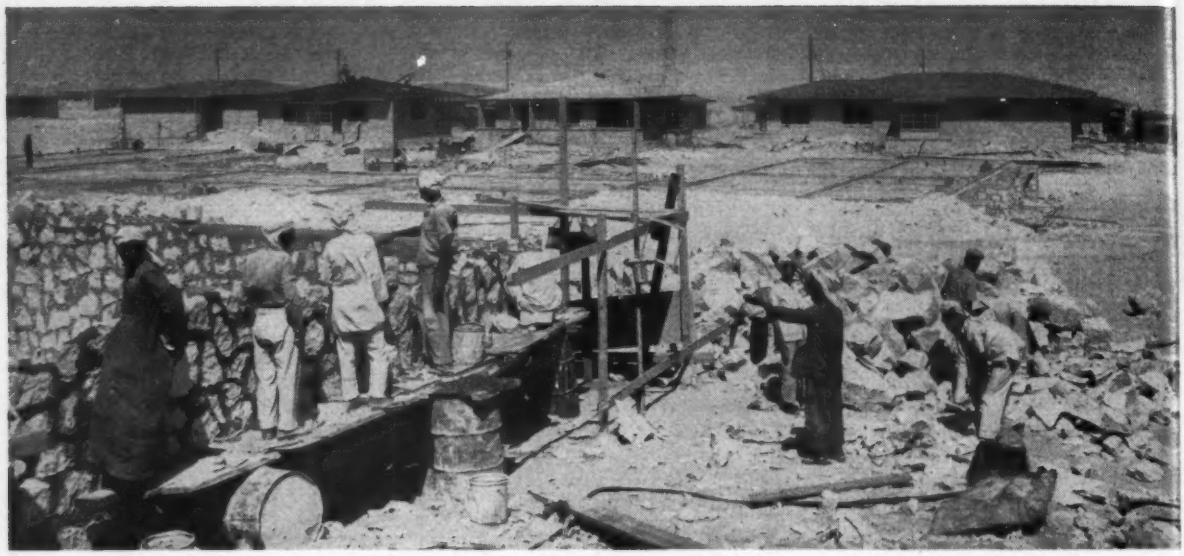
The United States, which in years past has been an important surplus area supplying to all corners of the globe, is today importing approximately the same amount as it exports and is expected to become a net importer on balance next year. It is also anticipated that in the next 5 years the United States will become a diminishing factor in the export

(Continued on page 232)

TABLE 4—WORLD REFINERY RUNS (EXCLUDING RUSSIA)
(Thousands of barrels daily)

	1946	Last quarter 1947	1951
United States	4,740	5,275	5,621
Caribbean	774	837	1,012
Other Western Hemisphere	432	497	621
Total Western Hemisphere	5,946	6,609	7,254
Europe	260	320	756
Middle East	637	720	820
Far East	45	100	265
Other Eastern Hemisphere	33	33	35
Total Eastern Hemisphere (excluding Russia)	975	1,173	1,876
Total world (excluding Russia)	6,921	7,782	9,130





American housing under construction at Dhahran. Houses, offices, and community buildings are air conditioned

by W. F. Moore

FOURTEEN years ago, the directors of Standard Oil Co. of California decided, after long and earnest study, to take a long risk in a sun-baked desert halfway around the world.

Today, the wisdom of their decision is dramatically attested by a $140,000,000 industry which public officials and private citizens alike have hailed as a striking example of the beneficent vitality of the American system of free enterprise.

Fourteen years ago, no one could know whether oil even existed beneath those hot sands of Arabia. Today, 58 wells are producing an average of nearly 300,000 bbl. daily, of which 115,000 bbl. daily is being refined at the company's modern refinery at Ras Tanura. Tomorrow—which is to say by 1950—there is envisioned a vastly expanded enterprise that will bring the total investment to more than $400,000,000, making possible a 600,000-bbl. daily capacity to the sea, of which 300,000 will flow to the Levant coast through the big new Trans-Arabian pipe line.

This, in brief, is the story of Arabian American Oil Co.'s venture in the Middle East. The visitor today sees the result of 14 years of struggle: the lofty refinery, the stabilizers, the terminals, the pipe lines, the oil derricks, the modern homes and offices, and auxiliary structures. What the visitor cannot see is the long road that led to this happy destination. A passing glimpse may be of interest, but first let us look at the situation as we find it as this year of 1947 draws to a close.

The concession covers an area of approximately 440,000 sq. miles, equal in size to the states of California and Texas combined. Its proved reserves are estimated at approximately 6 billion barrels, and prospective reserves are of very much greater volume. Five fields have been discovered.

Yesterday—

A SUN-BAKED DESERT

Today—

A $140,000,000 INDUSTRY

Tomorrow—

A 600,000-BARREL DAILY PRODUCTION

Dammam field—directly opposite the northern end of Bahrein Island—was the scene of the company's first operations in Saudi Arabia. It was there, after many months of exploration, that the first well was spudded, in April 1935. The results were disappointing. Eight more wells were drilled, all of them in the Bahrein zone, without achieving commercial production, and a general atmosphere of deep discouragement prevailed, both in the field and in the San Francisco office.

Then, after 3 years of defeat, they hit the Arab zone at 4,500 ft., and—at last—commercial production had been won.

Dammam Production

Today at Dammam, production has been running at about 90,000 bbl. daily, with 31 wells producing from the Arab zone and 2 from the Bahrein zone. The field covers about 9,000 acres and embraces four zones with a total thickness of about 500 ft. The oil is all about the same gravity—35°.

In Abqaiq field, lying about 40 miles southwest of Dammam, oil was discovered in the Arab zone late in 1940, and 24 wells are now producing about 190,000 bbl. daily. There is one water observation well; deeper drilling is in progress on one well; and rigs are up for the drilling of four others. Depths range from 6,100 to 7,400 ft. The upper zone at Abqaiq is about 90 ft. thick, has an area of about 10,000 acres, and produces oil of 28° gravity. The lower zone, about 235 ft. thick, encompasses about 60,000 acres and the oil runs from 36° to 38° gravity.

THE AUTHOR

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W. F. Moore is president of Arabian American Oil Co., a post to which he was elected March 14, 1947, following service as general manager of foreign operations for The Texas Co. Moore joined The Texas Co. in 1920 at the Port Arthur, Tex., refinery. In 1929 he was named assistant to the manager and later assistant to the vice president of the refining department. After other assignments with the company he became in 1938 assistant manager of Texaco's purchasing department. In 1943 he was made assistant to the vice president, foreign operations department, and in 1945 appointed foreign-operations general manager.

Aerial view of Abqaiq, third oil field in Saudi Arabia discovered by Aramco. Here wells are drilled to between 6,500 and 7,000 ft. Discovered in 1941, 25 wells are now producing in this field at the aggregate rate of 200,000 bbl. per day. Oil from Abqaiq field is sent through pipe line to stabilizers at Dhahran, about 40 miles to the north

Qatif field, 17 miles north of Dammam, has two completions, producing about 4,000 bbl. of 32° oil daily. It has two zones: the upper about 110 ft. thick and the lower about 215 ft., and is believed to embrace several thousand acres. One additional well is being drilled. Depths are about 7,500 ft.

There are also two completions in Buqqa field, located about 20 miles northeast of the center of Abqaiq; but there is no production at the present. The oil tested at 36° gravity. Another well is being drilled. Depths are about 7,200 ft. The field is believed to have an area upwards of 2,000 acres. It may likely prove to be a northern continuation of Abqaiq.

At Abu Hadriya, 100 miles north of Dammam, there is one completion at 10,000 ft. and one well standing. The oil tested at 35° gravity.

There are three other wells in Saudi Arabia; one at Al Jauf, in the northeastern part of the country, went to 11,000 ft., and had shows, but is not productive; another at Ma'Agala, was drilled to 2,800 ft. but was never carried down; and the third, at Al Alat, was drilled to about 4,000 ft., but was also never carried down.

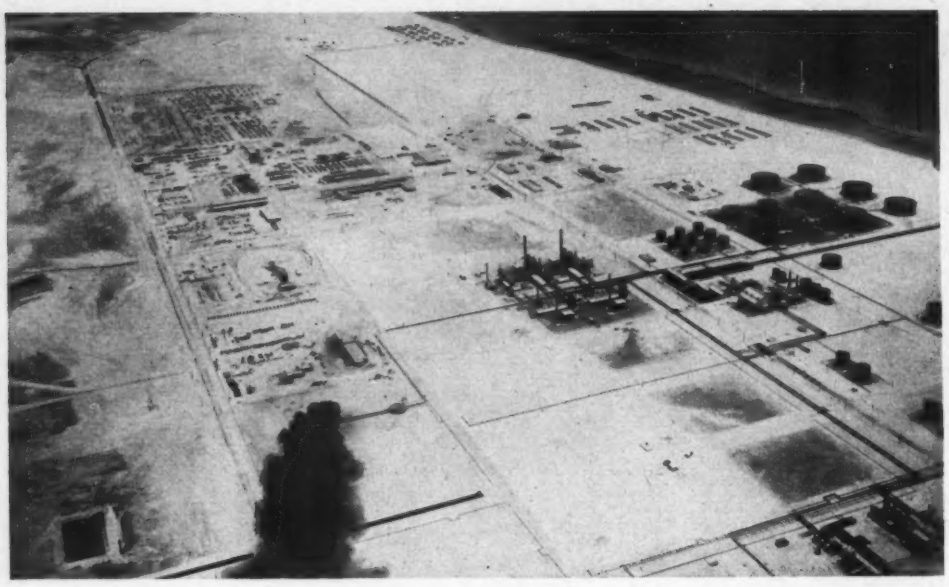
It is only since the war that large-scale refining operations have been carried on in Saudi Arabia. A small plant had been completed in October 1940, at Ras Tanura, about 40 miles northeast of Dhahran, but it had a capacity of only 3,000 bbl. daily. Its operation was discontinued at the end of 1945.

The war imposed added demand upon Middle East oil resources. In 1943, the Joint Chiefs of Staff approved the use of materials for Aramco's new and ultramodern installation at Ras Tanura to help supply the enormous military requirements. As a war project, it was rushed to completion in 1945 at a cost of approximately $50,000,000. In this work, about 1,500 Americans and 10,000 Saudi Arabs were employed for 1½ years.

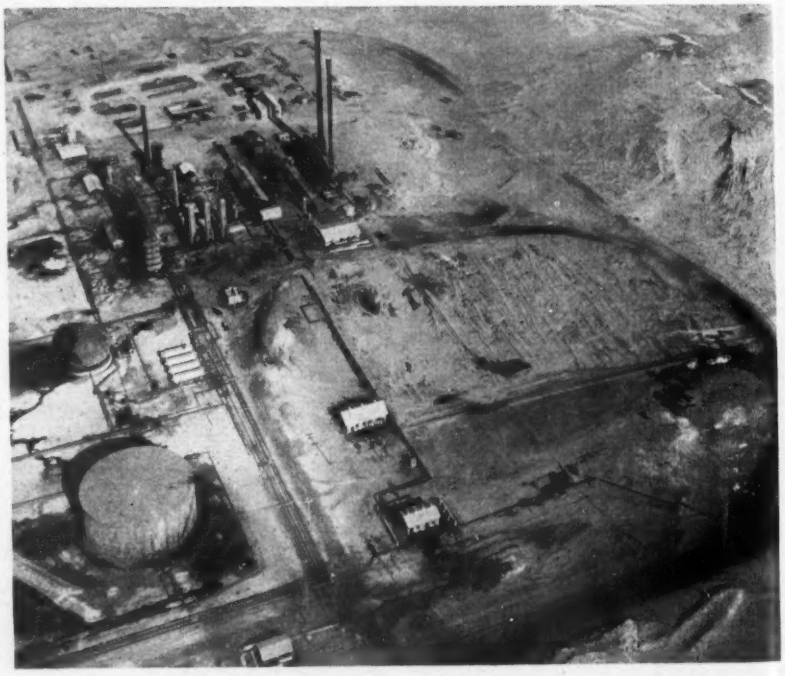
The plant is unique in several ways. First, it was financed entirely by the company, without government help. Second, it was completed on time and within the estimated cost figures. And, third, while rated in advance to have a capacity of 50,000 bbl. daily, it has actually been operating at 115,000 bbl. daily—or 230 per cent of originally rated capacity.

The new refinery is located on a beautiful strip of white sand, and immediately adjoining it is the American colony, complete with air-conditioned homes, mess halls, recreational facilities, two hospitals, and a power plant. The power plant is one of the most modern industrial plants in the Eastern Hemisphere.

Aerial view of drilling wells at Dhahran, operational headquarters for Arambo



Left: Aramco's large modern refinery at Ras Tanura on the Persian Gulf Coast of Saudi Arabia processes Arabian crude oil into gasoline, Navy special fuel, diesel fuel and other products. The plant was designed in 1943 as a war project and rushed to completion in 1945. Rated capacity is 50,000 bbl. daily. Below: Aerial view of Aramco's stabilizing plant at Dhahran, where oil is received from Abqaiq field. Since Arabian crude has a rather high hydrogen sulfide content, it has to be reduced before it can be shipped



It supplies Dhahran, as well as Ras Tanura.

Supplying this big refinery required building pipe lines from the fields and the drilling of additional wells. Ras Tanura refinery takes 115,000 bbl. daily; another 105,000 bbl. daily is moved by under-water pipe line to Bahrein Petroleum Co.'s refinery on Bahrein Island. The rest, after first passing through the stabilizer at Dhahran for sweetening, is piped to the terminal and loading wharf about 3 miles from the Ras Tanura refinery for shipment abroad, mostly to Europe.

The company's marine terminal at Ras Tanura can handle four tankers at once, loading them at a rate of from 10,000 to 12,000 bbl. an hour. The average tanker can be loaded and on its way again in about 12 hours.

Much of the company's present refinery output — gasoline, kerosine, diesel fuel, and fuel oil (mostly Navy Special) — is going to the United States Navy for use in the Far East. Without this supply, the Navy's famous "magic carpet" could not have done its spectacular job of bringing troops home from the Far East.

What of Tomorrow?

So much for the present. Now, for just a brief look at the past before we look at the future. When the first Americans arrived back in 1933, they found that they were up against some very rugged living. Few Americans had been beyond the treaty port of Jeddah—in fact, special permission had to be obtained to land, at all, on Arabian soil. These early explorers, geologists, and production men were required to have the King's soldiers accompany them wherever they went, and, in order to minimize the strangeness of their appearance, the men grew beards and wore Arab clothes. The Arabs were understandably suspicious of these strange newcomers. Many, indeed, were frankly hostile, and quite ready to show their feelings.

Worst of all, it was hot: 120° F. in the shade on many summer days, and sometimes reaching 160° F. in the sun, and with high humidity besides. There were flies, and dysentery, and there was no suitable housing in that sparsely populated area. All in all, it was no Utopia.

But these men were determined they would win. With the characteristic tendency of Americans to make themselves comfortable wherever they live, they soon perspiringly constructed a "wildcat" camp at Dhahran which was a great improvement over the tents and makeshift Arab housing in which they were first quartered. While the field crews were drilling wells and installing oil-handling facilities, other crews were working at the job of making life more livable.

In Dhahran as in Ras Tanura the houses are air conditioned. So are the offices and community buildings. The company provides water, electricity, gas, and telephones. Large commissaries are necessary for the handling and distribution of foods, the bulk of which are brought in from the States. Thanks to proper irrigation, trees, grass, and flowers thrive around the settlements. The

employes have their own fresh-water swimming pool, golf course, tennis courts, club houses, and — of course—the beach, one of the finest in the world. A modern American hospital provides medical and surgical care to all employes, with skilled American surgeons to perform even major operations.

There are now approximately 2,000 American employes, and about 200 wives and 150 children. There are also about 2,000 employes of other nationalities. A large percentage of the employs are World War II veterans, which means that Aramco has its veterans' housing problem, too.

Houses have been built of native brick and masonry, but some have stood unfinished for 6 months or longer because it has not been possible to get glass and plumbing.

Little realized is the fact that, out of every $2 invested in the concession, $1 goes into housing and other facilities necessary to take care of employes. The company always bears in mind that it is a guest in Saudi Arabia, and that it must conduct itself at all times so that the best interests of its host are served. His Majesty, Kink Ibn Saud, indicated recently that he believed that the company had succeeded in this regard, for he said:

"Aramco is here as our guest and our partner. We consider it a part of us, and I shall protect Aramco as if it were my most valuable subject."

Slightly less than 12,000 Arabs are employed today. This figure is expected to be increased to 15,000. They live in quarters adjoining the American camps. In the producing fields and in the refineries, they work side by side with American craftsmen and have shown great aptitude in learning new skills, even in the operation of the most complicated equipment.

Social Benefits

In cooperation with the Saudi Arab Government, the company provides schools and teachers for its Arab employes; assists in the building of roads, ports and railroads, the drilling of water wells, and the development of irrigation and agricultural projects. It aids in the building of sanitation facilities; provides electricity without profit; and makes its surplus hospital facilities available to the general public.

Among the company's major contributions to the development of Saudi Arabia has been its conquest of transportation problems. Desert sands were impassable to ordinary automobile tires, so a special type of oversize, heat-resistant tire was developed. It defies the soft sands and makes desert travel readily possible.

The drilling of water wells has made possible the year-around use of desert trails that formerly could not be traveled in summer months. To drill these wells, crews must travel in motorized caravans that include a portable drilling rig, insulated water-tank trucks, commissary trucks, and air-conditioned office and dining-hall trailers to serve as living quarters.

The enormous Kenworthy trucks, developed for heavy hauling over the desert, are veritable locomotives on tires. In addition, the company maintains a fleet of literally hundreds of automobiles, trucks, and station wagons.

An important contribution to and improvement in transportation facilities on the Persian Gulf Coast is soon to be made by the construction of a 7-mile pier to deep water and other port facilities at the town of Dammam, and of a railroad from that point to Dhahran and Abqaiq. The work will be done by the company as a governmental project. The King has hopes that the railroad may eventually be extended 350 miles inland to Riyadh (the capital) and afford a convenient solution to the new difficult problem of transporting freight and passengers inland.

And so, a long road has been traveled since the first exploratory crews began arriving back in 1933. The original hostility and suspicion on the part of the Arabs has been replaced by friendship and trust. The partnership between East and West is a real one, and its future is rich with great possibilities, with world demand increasing and, from all evidence, due to continue its upward trend for a number of years.

As previously mentioned, present production is running at about 300,000 bbl. daily, but present plans call for a capacity of 600,000 bbl. daily by 1950. Production from Abqaiq is expected to be increased by the drilling of additional wells; and further exploration and development will be carried forward at Qatif and Buqqa. Probably by next year, drilling will be renewed at Abu Hadriya, where it is known that the first well drilled

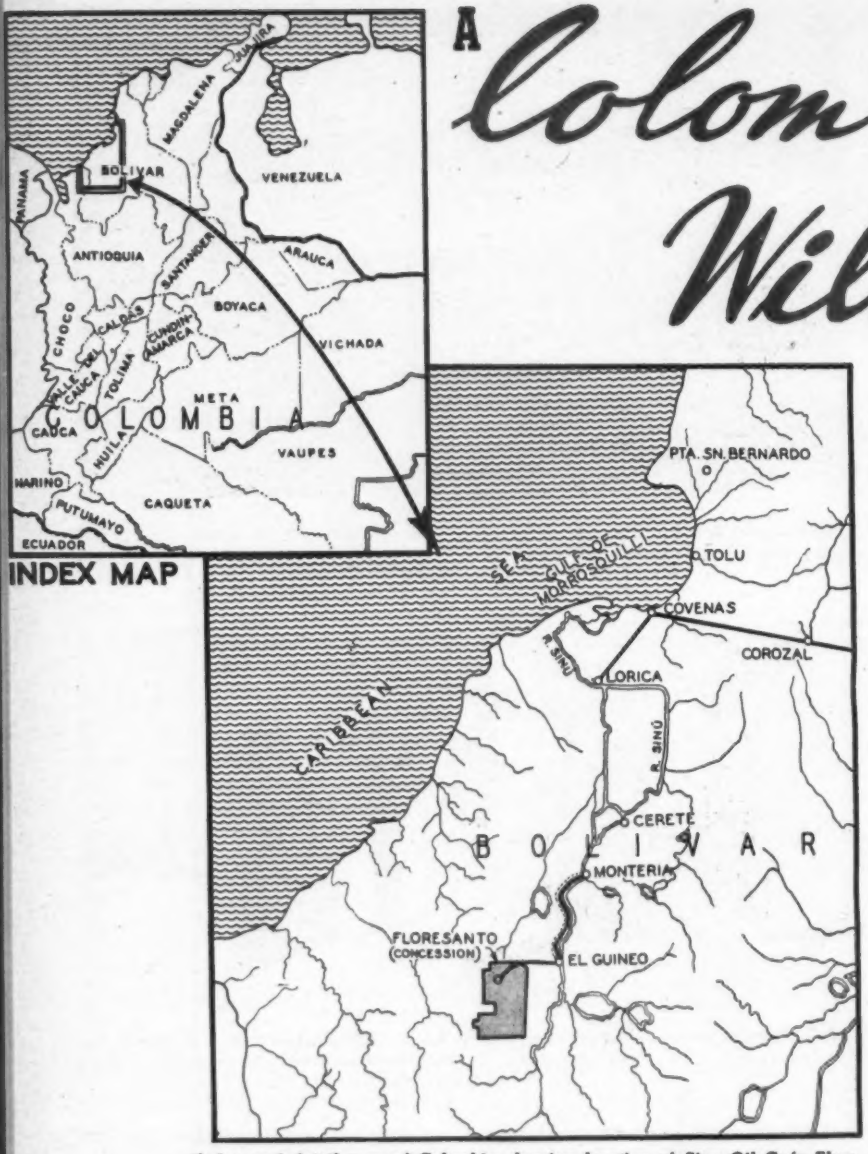
(Continued on page 233)

Americans at Dhahran find the fresh-water swimming pool, built by Aramco, a welcome relief from summer's heat. Saudi Arabia is torrid in the summer, but the climate is healthful and children thrive in it

Floyd Ohlinger, general manager of Aramco in Saudi Arabia, presents 10-year service pins to a group of Arab workmen. More than 100 Arabs have been with the company 10 years or longer

A Colombian Wildcat OPERATION

*by Harrison H. Heisler**



Index and detail map of Colombia showing location of Sinu Oil Co.'s Floresanto concession. A pipe line was constructed from Lorica to Covenas, to tie in for fuel-oil supply with South American Gulf Oil Co.'s pipe-line terminal at that port

WILDCAT drilling in Colombia presents many and varied operational problems. Aside from the difficult drilling conditions sometimes encountered the equipment, materials, and labor that are required to keep a remote wildcat well in operation often constitutes a major share of the expense. A good case in point is the 10 Floresanto well drilled by the Sinu Oil Co.† on the Floresanto concession in the Department of Bolivar.

The Floresanto concession lies 12 miles west of Sinu River, 18 miles south of the river port of Monteria.

In order to service the concession, the company constructed a port and campsite on the Sinu River at El Guineo (see map). A dry-season dirt road or trail existed between Monteria and El Guineo, which has since been maintained by company equipment for dry-season use. An all-weather road, 12½ miles long, had to be built from the El Guineo port to the Floresanto concession.

As the 10 Floresanto well was to be drilled with a medium-heavy steam rig, the question of boiler fuel oil and water supply was an early consideration. Closest source of fuel oil to the concession is the South American Gulf Oil Co. pipe-line terminal at Covenas on the Caribbean Sea, some 20 miles from the mouth of the Sinu River.

Since it is not practical to send the company flat-bottom river oil barges and tugs across the open sea from Sinu River to Covenas, a 4-in. oil line was laid across the 16 miles from Covenas to Lorica, a river port. From there the company barges and tugs carried the oil 100 miles up Sinu River to the El Guineo port and pump station. A 12½-mile 4-in. pipe line then moved the oil to the well site. This line also served to pump boiler feed water from Sinu River to a 30,000-bbl. settling pit at the rig.

The supply problem was further complicated by the fact that during the 5-month dry season, from December to April, the river level drops so low that river boats and barges cannot be used. This, of course, meant that a 5-month supply of fuel, mud material, drill pipe, casing, bits, etc., had to be stored near the well in order to carry on operations throughout the dry season. Nine thousand barrels of steel tankage were provided for a reserve fuel-oil supply, as well as a 25,000-bbl. open earthen pit.

Large Capital Investment

It may readily be seen that the capital investment required to establish the Floresanto operation was considerable. Additional to the camp to house administrative personnel and laborers at El Guineo, a second camp for the operational personnel and laborers was established at Floresanto. An isolated wildcat operation in Colombia must be a self-contained unit in order to carry on efficiently and this meant an initial cash outlay for river boats and supply barges, tractors and bulldozers, road-maintenance equipment, various types of trucks and pickups, a garage, a small machine shop, carpenter shop, laundry, light plants, refrigeration equipment, welding machines, a water service system including filters and sewage-disposal units, and sundry other items as well as the drilling

*Petroleum engineer, Socony-Vacuum Co. of Colombia.

†Sinu Oil Co. is a joint subsidiary of Socony-Vacuum Oil Co. of Colombia and Tropical Oil Co. Operations of Sinu Oil Co. are carried out by Socony-Vacuum.

rig and its accessories such as a cementing unit, etc.

To maintain all the equipment, a main warehouse at El Guineo and a drilling tool warehouse at Floresanto were stocked with the necessary spare parts to keep the rolling stock, floating equipment, drilling rig, and camps in continuous operation. In addition, fishing tools, cutting tools, cement retainers, packers, and production equipment were kept on hand for emergency use.

A large number of laborers (approximately 250), mostly inexperienced in oil-field work, were hired locally and trained to operate the various machines. To provide for their welfare a company hospital was maintained at El Guineo under the supervision of a Colombian doctor. This is a necessity because of the prevalence of routine diseases as well as the every-day injuries encountered in oil-field work. A radio transmitter and receiving set at El Guineo kept in daily contact with the head office in Bogota, as well as the company's main warehouse in Barranquilla so that orders could be received promptly and emergency supplies requested with a minimum of delay. The personnel was distributed as follows:

El Guineo — Administrative: Field superintendent, warehouse manager, camp steward, transportation foreman, field accountant, assistant accountant, field cashier, assistant cashier, labor-relations man, warehouse assistant, assistant steward, doctor, radio operator.

Floresanto — Operational: Drilling-tool foreman, drilling supervisors (4), welding foreman, well site geologist, field petroleum engineer.

The drilling operations carried out in 10 Floresanto are interesting from the engineering standpoint, in that several different types of drilling mud were used. Previous subsurface history of the area indicated that a long section of slow drilling, badly fractured, highly dipping gaseous heaving shale could be anticipated. The casing program had been set up for a 12,000-ft. hole to test the Charrura sandstone, a possible oil-bearing formation as yet untested in Colombia.

Laboratory tests with shale samples from the area showed that the shales would not disintegrate as rapidly or as completely in saturated salt water as they would in fresh water, so it was decided to experiment with a salt-saturated starch mud. No serious hole troubles were expected to occur above 3,000 ft. and a mud program was laid out to drill the 17½-in. surface hole with fresh-water bentonite mud to 3,000 ft. and set 13⅜-in. casing, then change over to a saturated salt starch mud and drill 12¼-in. hole to 7,000 ft. and set 9⅝-in. casing. Below 7,000 ft., 8⅝-in. hole was to be drilled to 10,000± ft. at which depth a full string of 7-in. extreme line casing would be available for running if required. If the 7-in. casing was to be used as a protection string 6-in. hole would be drilled below, and 2,000 ft. of 4½-in. drillable liner would be on hand to run at final depth if necessary.

As a matter of precaution, complete mud materials for a high pH starch mud were shipped into the location in case the salt-saturated starch-mud experiment failed. Also, 8,300 sacks of barytes were stored in the well mud house since weighting material would probably be needed before the end of the dry season.

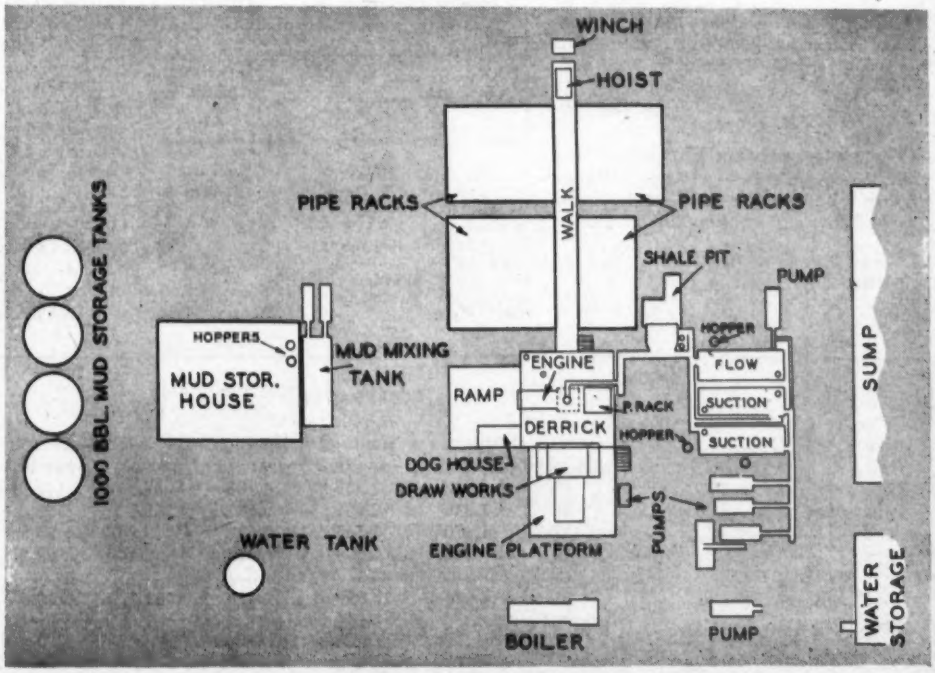
The well spudded in in shale dipping at 60° and after cementing 45 ft. of 20-in. conductor pipe, 17½-in. hole was drilled using 6⅝-in. drill pipe and 8-in. drill collars. From the start the steep formation dip made it difficult to drill straight hole and only ½ to 1 point of weight could be safely carried on the bit. Penetration rate was therefore slow averaging only 31.3 ft. per day. Drilling progress also became hampered because the rock bits would pulverize the shale into flour-size particles which caused the bits to ball up; drag bits would not go in this formation.

At 1,900 ft. a strong salt-water flow broke into the mud column and raised the mud NaCl content from 350 to 6,000 p.p.m.; caused mud flocculation, and the drill pipe became stuck. After several days' delay, the mud was brought under control by phosphate treatment, but, although 5,031 sacks of barytes were used attempting to stop the salt-water flow, it did not entirely cease. Mud weight leveled off at 12 lb per gal., viscosity 45 seconds A.P.I., water loss 10 cc. and drilling proceeded to 2,926 ft. At this depth a full string of 13⅜-in. casing was landed and cemented with 1,555 sacks of cement.

After completion of the cement job the well started flowing salt water and gas in the 13⅜-in. by 20-in. annulus. To kill this flow a steel plate with a 2-in. circular opening was welded over the annulus, and 200 ft. of 1-in. line pipe was run down the outside of the 13⅜-in. casing. Three successive squeeze jobs through the 1-in. pipe finally killed the flow; a total of 247 sacks of cement was used.

A 12¼-in. hole was drilled below the 13⅜-in. casing, using the 6⅝-in. drill pipe and 8-in. drill collars. At depth 3,568 ft. drilling was temporarily suspended in order to replace the bentonite mud with salt-saturated starch mud. This mud has been mixed in the following proportions per barrel:

	Pounds
Bentonite	15
Salt	110
Starch	15
Salt-water clay	1.5
Barytes	6.25



Drilling rig layout used on the 10,876-ft. Colombian test

MUD MATERIALS USED

	100-lb. sacks				
	Bentonite	Salt-water clay	Starch	Barytes	Chemicals (tons)
Bentonite mud, 0-3,568 ft.	703			5,313	5.80
Salt-saturated starch, 3,568-4,442 ft.	155	85	436	3,003	*168.44
High-pH starch, 4,442-10,276 ft.	307	15	930	28,916	39.33
Lime-base starch, 10,276-10,876 ft.	35		99	2,273	6.48
Total	1,200	90	1,436	39,505	220.05

*Salt.

The 900 bbl. of new mud had the following characteristics:

Weight, lb. per gal.	10.2
Viscosity, sec. A.P.I.	46
Water loss, cc. (30 min.)	1.6
Cake, in.	1/64
Init. gel, g. Stormer	3
10-min. gel, g. Stormer	10
NaCl, p.p.m.	310,000

The mud changeover took place without incident and the bentonite mud was stored in 1,000-bbl. mud-storage tanks. Drilling continued satisfactorily until the mud became badly gas cut at 3,770 ft. Before the mud could be conditioned, the drill pipe stuck in the gas-heaving shale but was worked loose successfully.

After building up the mud weight to 12.4 lb. per gal. and then reaming the hole, it became apparent that the salt mud was becoming loaded with fine shale particles that would neither dissolve nor drop out and no successful method of treatment could be found to remedy this condition. Viscosity, gel, and water-loss values all increased so rapidly that the only possible method of control was to continually keep reconditioning the entire mud system.

The mud condition became so bad that a complete new change of mud was pumped in the hole at 4,100 ft. The new mud makeup per barrel was:

	Pounds
Salt-water clay	9
Salt	110
Starch	18
Barytes	130
Sodium bicarbonate	2
Starch preservative	1

RIG-TIME ANALYSIS

	Per cent
Drilling	41.7
Reaming	10.3
Coring	1.8
Trips and connections	8.7
Circulating, mixing and conditioning mud	8.2
Deviation surveys	0.4
Fishing	2.8
Rig repair and maintenance	8.3
Running casing	1.1
Cementing W.O.C.	3.7
Waiting on Equipment, materials	8.2
Waiting on orders	0.2
Electric logging	0.8
Miscellaneous	0.4
Tearing down and moving out	3.4
Total	100.0

This mud tested:

Weight, lb. per gal.	12.0
Viscosity, sec. A.P.I.	46
Water loss, cc. (30 min.)	1.2
Cake, in.	1/64
Init. gel, g. Stormer	3
10-min. gel, g. Stormer	7
NaCl, p.p.m.	310,000

The new mud reacted in much the same manner as the first batch. At 4,364 ft. the mud became badly gas cut again and all of the available barytes on the concession was expended in raising the mud weight to 13 lb. per gal. Nevertheless, the drill pipe stuck one stand from bottom after starting out of the hole from 4,442 ft. The 6⅝-in. drill pipe was worked loose in 2 days by placing 2,200-psi. mud pressure down the pipe and then taking a 280,000-lb. strain.

The strain would move up the hole a few inches each time this was done and finally came loose after 120 ft. had been gained. At this time it was decided to discard the salt-saturated starch mud by displacing it with the original bentonite mud, then convert the mud system over to a high-pH starch mud. The bentonite mud, weighing 11.6 lb. per gal., was placed in the hole through open-end drill pipe from 4,172 ft. Then the well had to be shut in for 11 days while waiting on barytes shipments. In the meantime, 1,000 bbl. of high-pH starch mud are mixed, and weighted to 14 lb. per gal. as the barytes arrived.

Mud Became Flocculated

During the shutin time, the casing pressure built up to 250 psi. and the well made a considerable head of gas when opened up. The open-end 6⅝-in. drill pipe was lowered in the hole to the 13⅜-in. casing shoe at 2,925 ft. and the bentonite mud in the casing displaced by the high-pH starch mud. The bentonite mud had become completely flocculated, having a NaCl content of 50,000 p.p.m. Eleven days were allowed to slowly ream the hole to bottom, 4,442 ft., giving sufficient time to keep the high-pH mud in condition. The salt content of the high-pH mud gradually built up to 25,000 p.p.m., but control was maintained by the use of caustic soda, quebracho, soda ash and lime. The mud leveled off at 45 seconds A.P.I. viscosity, 2.5 cc. water loss, and weight 14.6 lb. per gal.

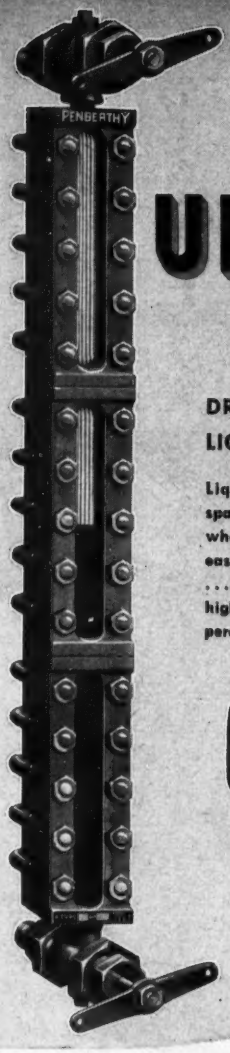
No further troubles were experienced until the swivel in use and a spare swivel both broke down at 5,440 ft. and the well had to be shut in for 5 days until a new swivel

(Continued on page 237)

BITS USED

Size (in.)	No. used	Hours drilled	Footage made	Footage reamed	Av. hours per bit	Av. feet per bit	Av. reamed per bit	Av. ft. per hour
17½	19	1,639	2,736	4,769	86.2	143.8	477.7	1.67
12¼	26	1,546	3,465	8,747	59.4	133.0	336.0	2.24
8⅝	37	1,470	3,545	5,639	39.7	95.5	152.2	2.40
6	9	245	566	328	27.2	62.9	36.4	2.31
Total	91	4,900	10,357	19,483	53.8	113.8	214.0	2.11
Feet cored			519					
			10,876					

QUALITY UNCOMPROMISED



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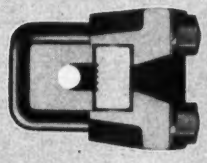

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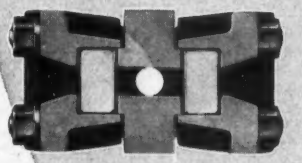
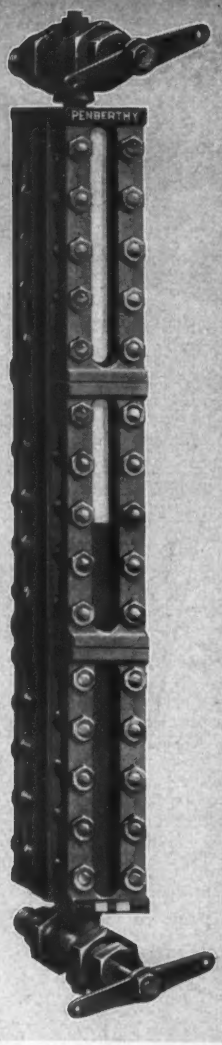
Transparent
DROP FORGED STEEL LIQUID LEVEL GAGES

Used to observe color and density of liquids under high pressures, and/or temperatures. Construction is exceptionally rugged . . . similar to Reflex types.





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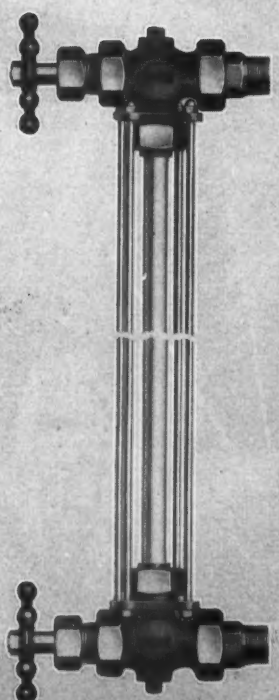

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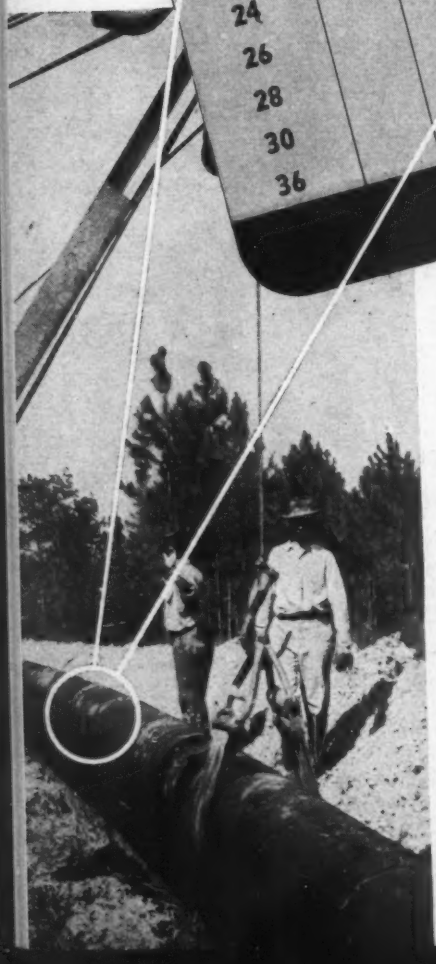
Pipe O.D. Inches	WALL THICKNESS .109	.141	.172	.188	.219	.250	.281	.312	.375	.438	.500
6	x	S	S	S	x						
6 5/8	x	x	x								
8	x	S	S	S	x	x					
8 5/8	x	x	x				x				
10	x	S	S	S	S	x	S	*x			
10 3/4	x	x	x						x		
12	x	S	S	S	S	x	S	S	x		
12 3/4	x	x	x							S	x
14		x	x	x	S	x	S	S	x		
16		x	x							S	x
18		x	x	x	S	x	S	S	x		
20			x							S	x
22			x	x	S	x	S	S	x		
24										S	x
26				x	S	x	S	S	x		
28										S	x
30				x	S	x	S	S	x		
36										S	x

*—10 3/4" OD is furnished in .279", not .281".
S—Indicates standard inventory sizes.
x—Indicates these sizes available in minimum quantities of 10,000 lbs.



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SURVEY of World Oil Fields

THIS is the second postwar edition of The Journal's annual survey of world oil fields outside the United States. Reports in this survey are based on information obtained directly from the operating companies, and in many instances from the governments of the countries in which the fields are located. Since properties in some less important oil countries are still in process of reconstruction, or under military control, information is incomplete in these countries, and no official information is yet available on oil operations in the U.S.S.R.

ARGENTINA

Official information covering 1947 operations of Yacimientos Petroliferos Fiscales, principal oil-producing company and owned by the government, not available. Following table gives summary of operations by areas.

Name of field—	Year of discovery	No. of prod. wells Flowing	No. of prod. wells Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Coleta Olivia	1945	....	....	.....	2,141	390,000	..	.....	35°
Comodoro Rivadavia	1907	....	....	2,300-5,300	39,784	292,000,000	..	Cretaceous sands	19°-26°
Mendoza	1925	....	....	550-8,200	7,805	22,500,000	..	Tertiary sand	12°
								Triassic sands	27°-30°
Plaza Huincul	1917	....	....	2,000-4,000	6,453	18,600,000	..	Jurassic sands	22°-38°
Salta	1925	....	....	1,750-5,000	2,637	27,000,000	..	Permo-Carb. sands	23°-53°
								Devonian	43°
Total (estimated)		210	3,360		58,820	360,490,000	50		

The following table summarizes the operations of the Standard Oil Co. of Argentina, S.A.

Agua Blanca	1926	....	4	2,300-3,600	77	1,267,000	..	Terija, Permian	22.5°
Cerro Tartagal	1927	....	2	2,300-3,600	33	89,000	..	Terija, Permian	45.0°
Lomitas	1927	....	30	700-3,300	217	3,322,000	..	Terija, Permian	42.6°
Ramos	1928	....	1	3,770-3,930	20	61,000	..	Devonian	53.6°
San Pedro	1928	3	14	1,800-3,300	889	14,055,000	1	Tupambi, Permian	30°-40°
Dadin	1924	....	38	1,640-3,300	304	7,902,000	1	Lotena, Jurassic	33.5°
Huincul	1923	6	33	2,600	555	3,642,000	..	Lotena, Jurassic	33.1°
Total		9	122		2,095	30,338,000	2		

The following table summarizes the operations of "Diadema Argentina" Sociedad Anonima de Petroleo (Shell).

Comodoro Rivadavia	1925	....	356	2,800	10,800	59,780,000	2	Cretaceous	25.9°

AUSTRIA*

Grubenfeld R. K. van Sickle	1937	....	25	3,000-4,670	793	5,000,000	..	Sarmartian, Miocene ss., Tortom, Miocene ss.	21.5°-29.3°
Neusiedl St. Ulrich	1938	25	60	3,000-3,670	6,210	12,070,000	4	Flysch, Eocene ss., Schlier, Miocene cong.	31.1°
Hauskirchen	1942	....	16	3,060-3,100	472	1,123,000	..	Schlier, Miocene cong.	31.-°
Miscellaneous	1937	2	49	2,700-5,700	3,675	12,664,000	..	Tertiary sds.	25 8°
Unknown	....	....	....	2,000	2,000	10,143,000	..	.....	....
Total		27	150		13,150	41,000,000	4		

*Austrian oil fields are under more or less complete Russian control and data available is incomplete and liable to error.

BAHREIN

Bahrein	1932	67	....	1,900-2,300	26,000	83,063,662	..	Cretaceous ls. and siltstone	31°

BOLIVIA

Bermejo	1922	2	3	2,086-3,674	307	611,000	..	Tarija, Permian-Triassic	26.4°
Camiri	1927	6	1	2,023-3,772	366	1,352,000	6	Iquiri, Devonian	52.7°
Sanandita	1926	2	11	1,686-4,392	239	1,428,000	1	Tarija, Permian-Triassic	41.9°
Total		10	15		912	3,391,000	7		

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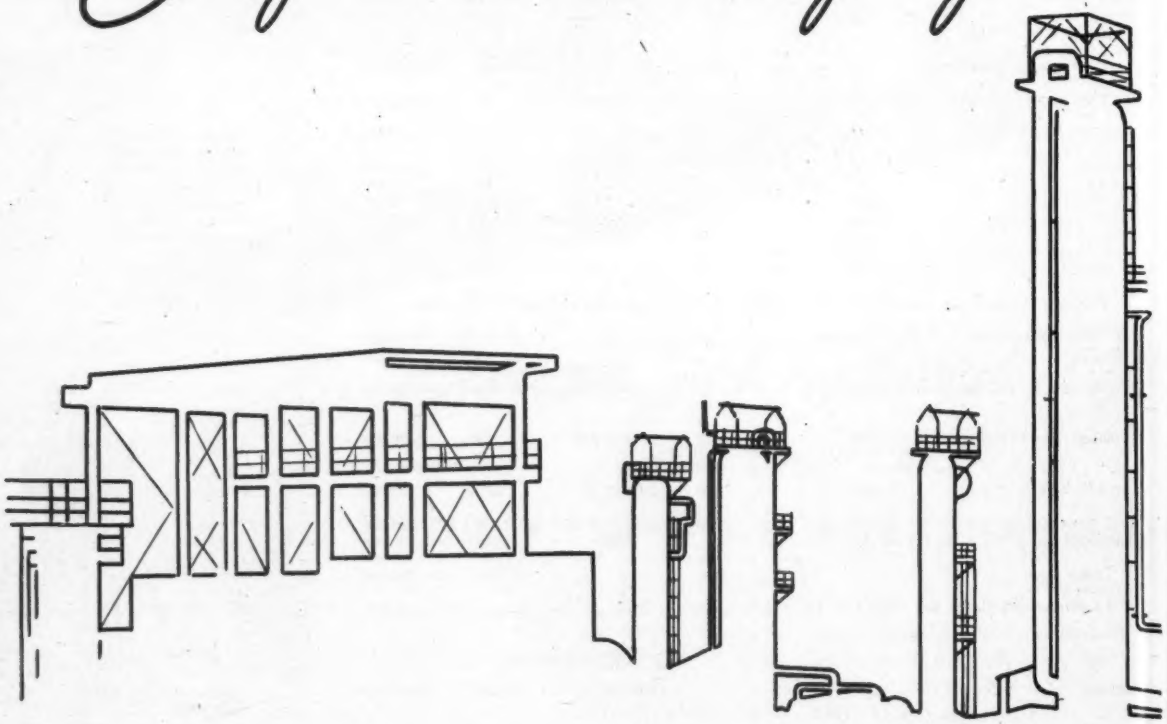
Skylines are changing



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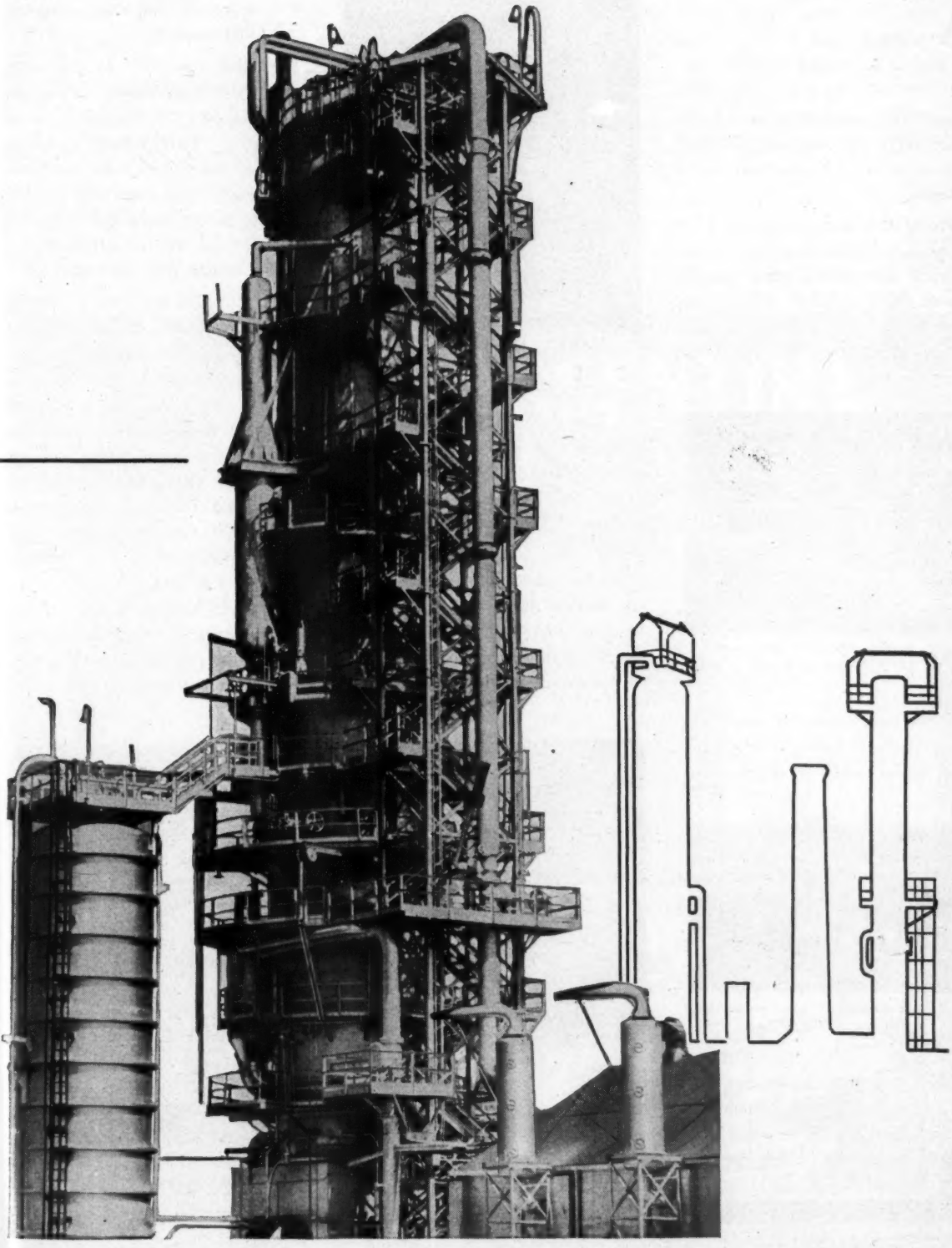


Simplifies Tunneling for Gas Line

By RALPH HOPPLE,
GENERAL CONTRACTOR
CANTON, OHIO

A CANAL, a creek, a river, three railroads and four highways all had to be crossed by a 20" gas pipe line only 1½ miles long which we recently constructed for a large mid-western gas company. The line is a by-pass between two valve stations.

To tunnel under a railroad or highway, we first made excavations on each side with a back hoe for access. Then, with the drilling machine shown in Fig. 1 and the sectional auger shown in Fig. 2, we drilled a 6-inch hole. A cable was pulled through the hole when the auger was removed. This cable was attached to a bulldozer on one side and a 12-foot section of 30-inch casing on the other. Tunneling was done by repeatedly pulling the casing into the earthen wall for several feet, then pulling it out with another bulldozer on the opposite side and removing the dirt. Fig. 3 shows the casing being removed after taking a "bite."

Fig. 1. The 4-cylinder engine-driven hole driller rides on a track.

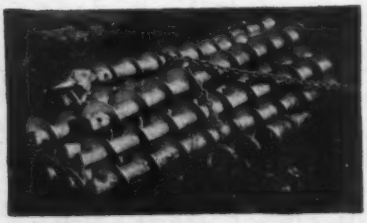


Fig. 2. These sections of 6" auger are assembled to drill holes over 70 feet long.

Fig. 3. Bulldozer pulls out the 30-inch casing.

This tunneling operation was done at the rate of about 17 feet an hour. An average underpass 70 feet long required a total of 8 hours for excavating, drilling and tunneling. To meet railroad requirements, tunnels under tracks were lined with 30-inch casing with a standpipe at one end. Each end of the casing was sealed around the line pipe with a coupling and rubber gasket.

Welding was done by the stove pipe method, as shown in Fig. 4, using Lincoln "Fleetweld 5" electrode and "Shield-Arc" Welders. The 5/16" pipe wall was machine-bevelled 60°. The joints were welded in three passes, using 5/32" diameter electrode for the stringer and 3/16" for the second and third passes.

For the canal and river crossings, the wall thickness of the pipe was 50% greater. The pipe was welded into a section long enough to cross the river. Each joint was reinforced by a welded-on sleeve. A back hoe riding on mats on the river bottom dredged out a ditch which was about 8 feet deep. The pipe section was attached by cable to tractors and pulled onto pontoons from which it was guided by stakes into the ditch in the river bottom. The back hoe then retraced its route and pushed sand on the river bottom back into the ditch to cover up the line.

Fig. 4. Bell-hole welders make final welds in the ditch.

The above is published by LINCOLN ELECTRIC in the interests of progress. Bul. 418, "Building Better Pipe Lines," is available. Write The Lincoln Electric Company, Dept. 2013, Cleveland 1, Ohio.

BRAZIL

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Aratu	1942	....	2	1,350	15	50,640	..	.....	13°
Candeais	1941	8	26	2,300-3,500	7,950	183,120	2	Santa Amaro	26°-36°
Don Joao	1947	....	3	850	1,300	.....	1	Sergi	....
Itaparica	1942	7	8	1,600-2,300	353	52,411	..	Santa Amaro and Sergi	30°
Lobato-Joanes	1939	....	2	1,450	60	53,830	..	.....	43°
Pitanga	1945	....	1	4,500	8	.....	1	Sergi	26°
Total		15	42		*9,686	340,001	4		

*Potential production from official reports. Marketed production estimated at 300 bbl. daily.

BURMA

Production in Burma is now limited to storage capacity until the completion of a new refinery at Syriam near Rangoon, with actual output approximately 2,000 bbl. daily. Many production properties were destroyed by Japanese and by owners previous to the Japanese invasion. Rehabilitation work which will require considerable redrilling in existing fields is now under way. Previous to the war the owners had 4,129 active wells in six fields with a production of 21,600 bbl. daily.

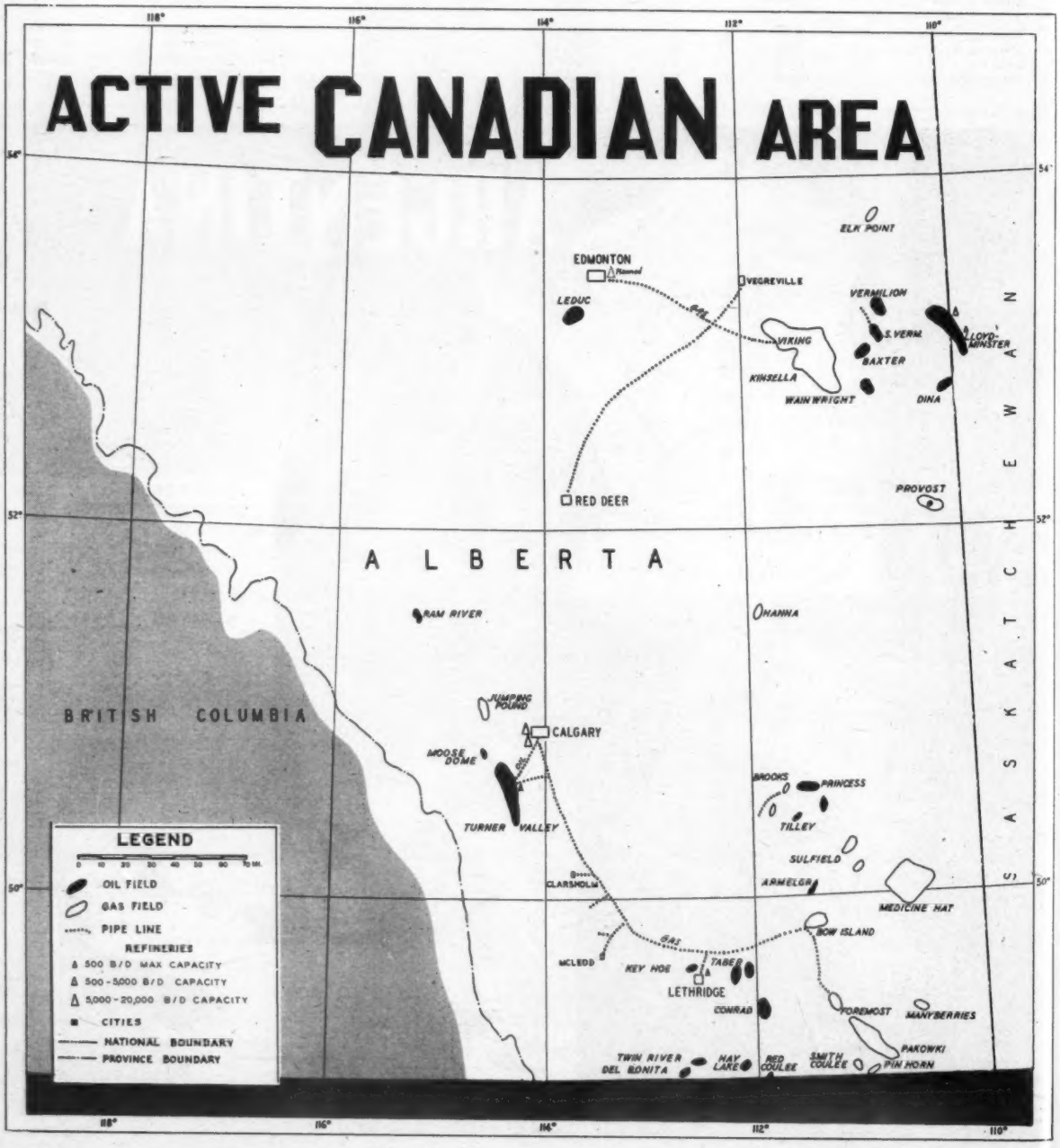
North Basin:							
Indaw	1918	....	1,100	.....	..	Miocene ss.	36°-37°
Central Basin:							
Sabe	1908	....	100-1,800	.....	..	Oligocene ss.	36°-37°
Yenangyat	1893	....	400-4,200	.....	..	Oligocene ss.	36°-37°
Lanywa	1919	....	2,000-5,000	.....	..	Oligocene ss.	36°-37°
Singu (Chauk)	1902	....	2,000-5,000	.....	..	Oligocene ss.	36°-37°

BURMA (Continued)

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Yenangyaung	1889		....	350-5,000		.....	..	Mio-Oligocene	36°-37°
Minbu, Palanyon, Yethaya	1910		....	450-700 / 2,300 / 600-1,900		.....	..	Mio-Oligocene	36°-37°
South Basin:									
Yenanma	1922		....	600-1,700		.....	..	Oligocene ss.	36°-37°
Padaukpin	1922		....	.....		.....	..	.....	...
Pyaye	1928		....	.....		.....	..	.....	...
Total			....		2,000	.....	..		

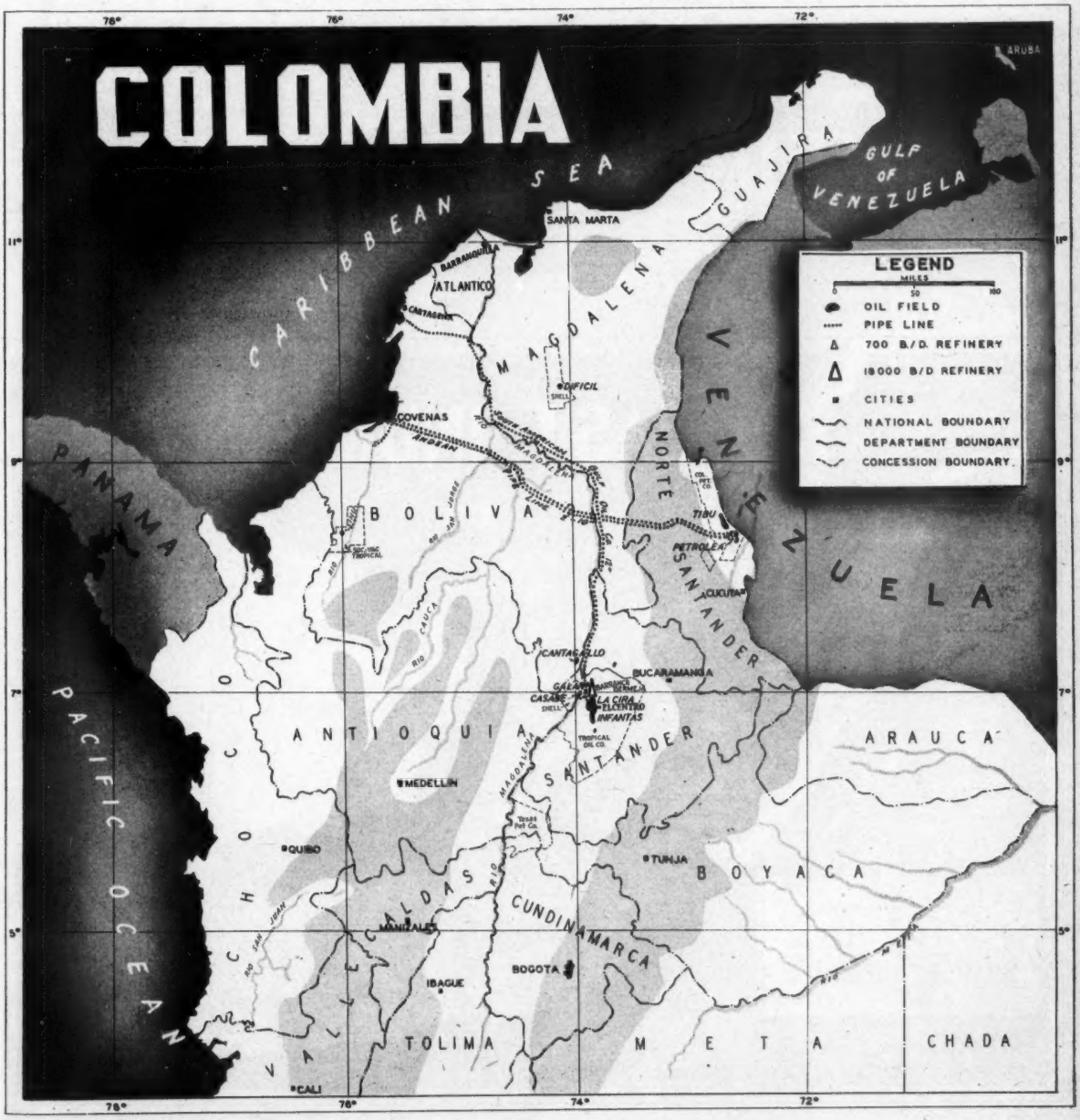
CANADA

Alberta:									
Conrad	1944	....	17	3,000	*555	483,000	..	Jurassic ss.	23°
Leduc	1947	*18	....	5,000-5,300	*1,100	35,000	10	Devonian, 2 horizons, dolomitic ls.	41°
Lloydminster, Alta. and Sask.	1940	....	*134	2,000	*3,148	512,000	†12	Lower Cretaceous ss.	10°-20°



CANADA (Continued)

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Princess	1941	4	3	3,300	*300	68,000	..	Lower Cretaceous ss.	
								Madison ls.	25°
Princess	1944	4	....	4,000	*150	132,000	..	Jefferson ls.	35°
Red Coulee	1930	....	....	2,500	....	329,000	..	Lower Cretaceous ss.	30°
Taber	1937	2	14	3,200	*587	730,000	2	Lower Cretaceous ss	17°-22°
Turner Valley:									
Shallow	1914	....	2	3,000-5,000	15	505,000	..	Blairmore (Lower Cret. ss.)	50°
Limestone	1924	289	..	4,000-9,600	‡14,375	¶88,810,000	6	Madison ls.	33°-50°
Vermilion	1940	....	45	1,800	*345	914,000	..	Lower Cretaceous ss.	14°
Wainwright	1926	....	5	2,200	*50	247,000	..	Lower Cretaceous ss.	18°
Miscellaneous	....	....	....	.....	.....	440,000	..	.....	...
New Brunswick:									
Stoney Creek	1909	....	6	3,000-4,000	65	390,000	2	Mississippi Alberta ss.	37°
Northwest Territories:									
Norman Wells	1920	45	....	1,500-2,000	500	2,284	..	Devonian reef ls.	33°



CANADA (Continued)

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Ontario:									
Old fields	(§)	10	1,578	350-3,000	350	30,000,000	16	Delaware and Onondaga, Upper Devonian, Salina and Guelph, Silurian; Trenton, Ord.	32°-38°
Becher	1946	8	....	1,830-1,950	140	6,419	5	Salina dol., Silurian	38°
Total		380	1,804		21,680	123,603,703	53		

*September data. †Rigs running. ‡Includes 1,050 bbl. daily natural gasoline. ¶Includes 6,073,000 bbl. natural gasoline. §Surface deposits worked 1850, first well 1858.

CHILE

Spring Hill	1945	6	....	7,550	1,000 bbl. daily potential field now shut in due to lack of equipment.		2	Spring Hill ss.	40°

COLOMBIA

Cantagallo	1943	7	....	1,490-6,870	Not shipping	143,000	..	Lisama sand	20.8°
Carbonera (Barco)	1939	....	2	800-1,720	20	138,547	..	Los Cuervos, Barco ss.	21.5°
Casabe	1941	20	40	3,750	13,700	7,278,603	3	Colorado ss.	21°
Colorado	1923	....	....	5,000	.....	6,000	..	Zone "C" sand	38.1°
El Dificil	1943	8	....	5,900	Not shipping	144,000	..	Oligocene lime	45°
Floresanto	1943	....	2	600-1,500	.....	13,000	..	Pajuil	44°-50°
Galan	1945	....	....	4,380	.....	33,000	..	Zone "A" sand	20.8°
Infantas (De Mares)	1918	6	453	400-2,200	8,400	146,108,014	3	A, B, C zones, ss.	24°
La Cira (De Mares)	1926	15	774	400-4,000	26,000	216,949,680	13	A, B, C zones, ss.	24.5°
La Monas	1926	....	....	1,000-3,800	.....	.....	..	Lisama sand	22°
La Petrolea (Barco)	1933	36	62	130-1,180	9,500	21,660,941	..	La Luna, Cogollo, Uribante ls.	35°-46.6°
Mugrosa	1929	....	....	3,000	.....	69,000	..	.....	30°
Rio de Oro (Barco)	1937	....	....	1,100-1,400	.....	66,149	..	Catatumbo, Rio de Oro ss.	30°-40°
San Luiz	1927	....	....	2,300	.....	8,000	..	.....	...
Tibu (Barco)	1940	34	16	4,200-9,000	12,200	7,713,592	3	Barco, Catatumbo, Uribante ls.	30.8°-49.7°
Velasquez	1946	1	....	7,185	Not shipping	14,495	1	Guaduas ss., Eocene	27°
Total		127	1,349		69,820	400,346,021	23		

CUBA

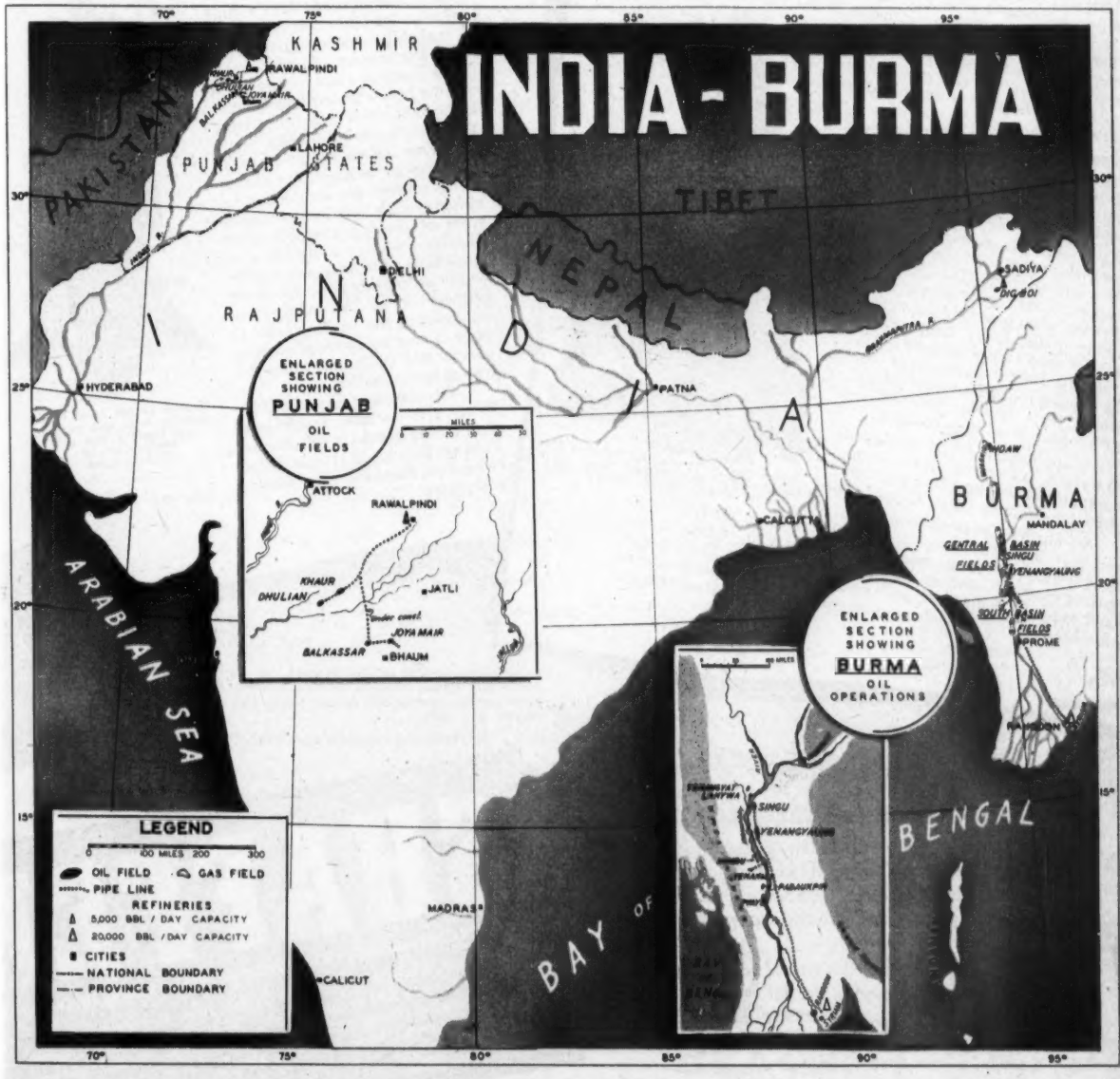
Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Jarahueca	1943	....	25	1,500	714	.....	..	.....	45°
Montembo	1880	....	200	600-1,800	186	.....	..	Eocene ss.	20°
Total		....	225		900	.....			

ECUADOR

Ancon	1920	216	526	800-4,500	4,500	.....	5	Eocene ss.	36°-41°
Tigre	1936	10	5	2,850-4,300	1,400	.....	..	Eocene ss.	39°
Miscellaneous	....	....	85	500-4,000	300	.....	..	Eocene sands	18°-39°
Total		226	616		6,200	.....	5		

EAST INDIES

Island of Borneo:									
Seria	1929	51	69	1,600-6,400	32,300	57,000,000	2	Tertiary sand	19°-33°
Miri	1911	....	32	300-3,000	430	65,500,000	1	Tertiary sand	21°-43°
B. Papan	1897	8	88	150-3,000	5,870	253,868,000	1	Tertiary sands	33.8°
Tarakan	1906	12	284	250-3,450	5,365	154,476,000	1	Tertiary sands	20.5°
Tarakan NIAM	1930	....	....	1,550-2,450	.....	§354,000	.	Tertiary sands	25.5°
Island of Ceram:									
Boela	1913	....	....	120-500	.....	§8,203,000		Tertiary sands	23.5°
Island of Java:									
Soerabajo	1914	(‡)	(‡)	2,500	(‡)	§1,660,000	.	Tertiary sands	23°-40°
Tjepoe	1889	†5	†38	300-2,700	(†)835	117,698,000	..	Tertiary sands	36.6°



On any well... In any country... By any language

SHAFFER

is the only way to say complete pressure protection!

FROM ALL PARTS of the world operators bring their pressure control problems to Shaffer because Shaffer not only pioneered modern pressure control techniques, but has continually developed and made new advancements that make Shaffer equipment the safest, most convenient, most adaptable and dependable pressure control equipment available for today's drilling and production operations. Included in the complete Shaffer line are such universally accepted pressure control units as the following . . .

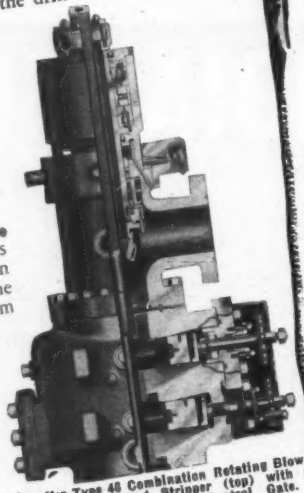
unmatched pressure control while *Drilling!*

The Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper combines in *one* unit every necessary feature for complete and foolproof pressure control while drilling under pressure. Maintains continuous leakproof seal around all elements in the drill string whether square, hexagonal, octagonal or round . . . and (except for such abnormally large tools as reamers and bits) the seal expands and contracts *automatically* to fit varying diameters in the string.

The unit not only maintains its seal while the drill string is rotating, but also while pipe is being stripped in or out of the well. There is nothing as complete, as advanced, as simple as this Shaffer unit!

The Shaffer Double Cellar Control Gate contains *two* complete ram compartments unitized into *one* body. The ram assembly in the upper compartment closes around the drill string when pipe is in the well, the ram assembly in the lower compartment closes off open hole when pipe is out of the well. Even in largest sizes (for 13⅜" casing) overall height of the Double Gate is *less than 29"* — smaller sizes even more compact.

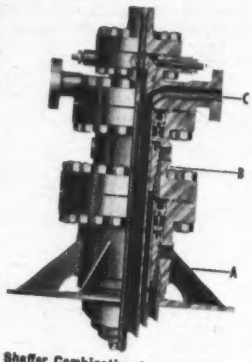
For applications where maximum conservation of vertical space is not essential, Shaffer also features a complete line of single Cellar Control Gates.



Shaffer Type 46 Combination Rotating Blow-Out Preventer and Stripper (top) with a Shaffer Double Cellar Control Gate.

All Shaffer Cellar Control Gates are not only unusually compact, but are simple to install . . . are readily adaptable to any type of power drive—air, hydraulic, electric or steam, as well as manual. They have rams that are easy and quick to change . . . are operated by dependable foolproof *mechanical* drive . . . and incorporate many other vital advantages.

For maximum pressure control while *Producing!*



Shaffer Combination Landing Base Head, with Spool Type Landing Head and Shaffer Type 46 Tubing Head

Operators throughout the world depend on Shaffer for efficient, compact and completely modern casing suspensions and pack-offs.

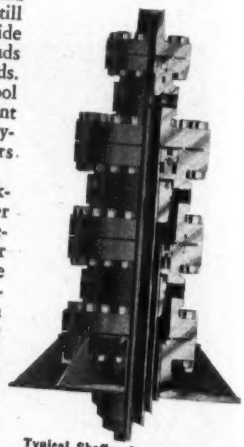
Shaffer Spool Type Landing Heads, the *pioneer* of this type of equipment, offer many unique advantages in simplicity of installation and maintenance. The Full-Opening design permits complete interchangeability of packing units to allow for change in casing sizes.

Where modern completion methods call for maximum installation compactness, the Shaffer Combination Landing Base Head (a) illustrated above is ideal. Although shown here with a Shaffer Spool Type Landing Head (b) and Shaffer Type 46 Tubing Head (c), where casing programs permit, the Spool Type Landing Head may be eliminated to provide still greater compactness. Also a wide selection of other Tubing Heads is available to meet varying needs.

The standard Shaffer Spool Type Landing Head arrangement shown below is another widely-used Shaffer design that offers many important advantages.

Five different types of packing units are available for Shaffer Heads to meet any completion requirement. In addition to regular types of packing assemblies, the Shaffer line also includes a recently-developed snap-ring type in which no threads are used in the internal bore of the Landing Head for holding the packing unit in place . . . and an all-metal packing unit for well conditions where this type of seal is desired.

The complete line of Shaffer Heads also includes special-purpose Casing Heads, a full line of Tubing Heads, Multiple Zone Hook-Ups, Bases and other similar equipment!



Typical Shaffer Spool Type Landing Head with regular type Landing Base and Shaffer Type 35 Tubing Head

Refer to pages 3454 to 3506 of your 1947 Composite Catalog for helpful information on the complete Shaffer line of pressure control equipment, fishing tools and other advanced oil tool products.

Write for the complete new Shaffer Catalog!

For Controlling Fluid Flow:

SHAFFER ADJUSTABLE FLOW BEANS

Still another important line of Shaffer pressure control equipment is Shaffer Adjustable Flow Beans—the ideal unit for regulating fluid flow on drilling wells, on production hook-ups, in refineries and wherever accurate control is desired.

Shaffer pioneered this type of equipment also, and offers the most complete line for every need—Conical Tips, Micro Tips, and electrically-heated Thermo Tips . . . regular and hard metal types . . . and in a full range of sizes from 1" through 4".

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EAST INDIES (Continued)

Name of field—	Year of discovery	No. of prod. wells Flowing	No. of prod. wells Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Island of Sumatra:									
P. Brandan	1893	(*)	(*)	150-3,750	(*)	§146,505,000	..	Tertiary sands	54.4°
P. Brandan NIAM	1928	(*)	(*)	1,450-2,050	(*)	§11,243,000	..	Tertiary sands	62.3°
Pladjoe	1898	(*)	(*)	150-5,700	(*)	§164,380,000	..	Tertiary sand and lime	36.6°
Pladjoe NIAM	1923	(*)	(*)	150-3,500	(*)	§82,255,000	..	Tertiary sands	50.8°
Talang-Akar-Pendopo	1916	(‡)	(‡)	2,900	(‡)	§100,122,000	..	Tertiary sands	37°
Djirak	1930	(‡)	(‡)	900	(‡)	§17,760,000	..	Tertiary sands	38°
Benakat	1930	(‡)	(‡)	1,500	(‡)	§30,398,000	..	Tertiary sands	37°
Selo	1938	(‡)	(‡)	2,200	(‡)	§47,000	..	Tertiary sands	...
Pase	1937	(‡)	(‡)	1,600-3,800	(‡)	§52,000	..	Tertiary sands	40°
Total		76	511		44,800	1,211,521,000	5		

*Areas not yet accessible by oil operator. †Major fields in these areas not yet accessible by oil operator. ‡Access not obtained by operator until August 1947. §Accumulated production prior to Japanese occupation.

EGYPT

Abu Durba	1918	....	27	300-1,500	Suspended	77,090	..	Nubian ss.	13°
Hurghada	1913	....	50	1,700-2,200	950	40,180,000	..	Pre-Miocene Nubian ss.	22°-24°
Gemsa	1908	....	....	750-1,700	Suspended	1,300,000	..	Lower Miocene ls.	23°
Ras Gharib	1939	37	38	1,500-2,400	22,000	64,500,000	1	Basal Miocene ls. and Pre-Miocene ss.	25°-26°
Sudr*	1946	....	....	2,700-2,900	.....	.....	1	Basal Miocene-Eocene	22°-24°
Total		37	115		22,950	106,057,090	2		

*Five successful producers have been completed in this newly developed field in the Sudr district of the Sinai Peninsula, 35 miles south of Suez. The initial delivery rate is expected to be approximately 5,000 bbl. daily.

FRANCE

Pechelbronn	1882	....	707	100-2,000	1,000	.....	..	Tertiary and Jurassic ss.	14°-35°
St. Marcet	1939	1	....	5,900	20	.....	..	Cretaceous ls.	32°
Total		1	707		1,020	.....	..		

GERMANY*

Nienhagen	....	....	....	.....	2,100	.....	..	.....	....
Emlichheim	....	....	....	.....	1,400	.....	..	.....	....
Heide	....	....	....	.....	1,170	.....	..	.....	....
Wesendorf	....	....	....	.....	1,050	.....	..	.....	....
Fuhrberg	....	....	....	.....	840	.....	..	.....	....
Lingen-Otheim	....	....	....	.....	820	.....	..	.....	....
Steimbke	....	....	....	.....	790	.....	..	.....	....
Georgsdorf	....	....	....	.....	700	.....	..	.....	....
Reitbrook	....	....	....	.....	700	.....	..	.....	....
Hanigsen	....	....	....	.....	590	.....	..	.....	....
Wietze	....	....	....	.....	430	.....	..	.....	....
Hohenassel	....	....	....	.....	370	.....	..	.....	....
Thoren	....	....	....	.....	350	.....	..	.....	....
Miscellaneous	....	....	....	.....	350	.....	..	.....	....
Total	....	....	....		11,660	.....	..		

*Detailed inormation unavailable. Above inormation believed to be reliable.

HUNGARY

Budafa	1936	38	40	3,300-3,900	3,352	15,265,000	..	Lower Pannonian, Pliocene	41°
Hahot	1942	4	1	3,800-4,200	1,289	2,714,000	1	Lower Pannonian, Pliocene	32°
Lovaszi	1940	66	23	4,400-4,900	7,213	18,855,000	3	Lower Pannonian, Pliocene	42°
Ujfalu	1941	....	....	2,000	.....	14,000	..	Lower Pannonian, Pliocene	40°
Total		108	64		11,854	36,848,000	4		

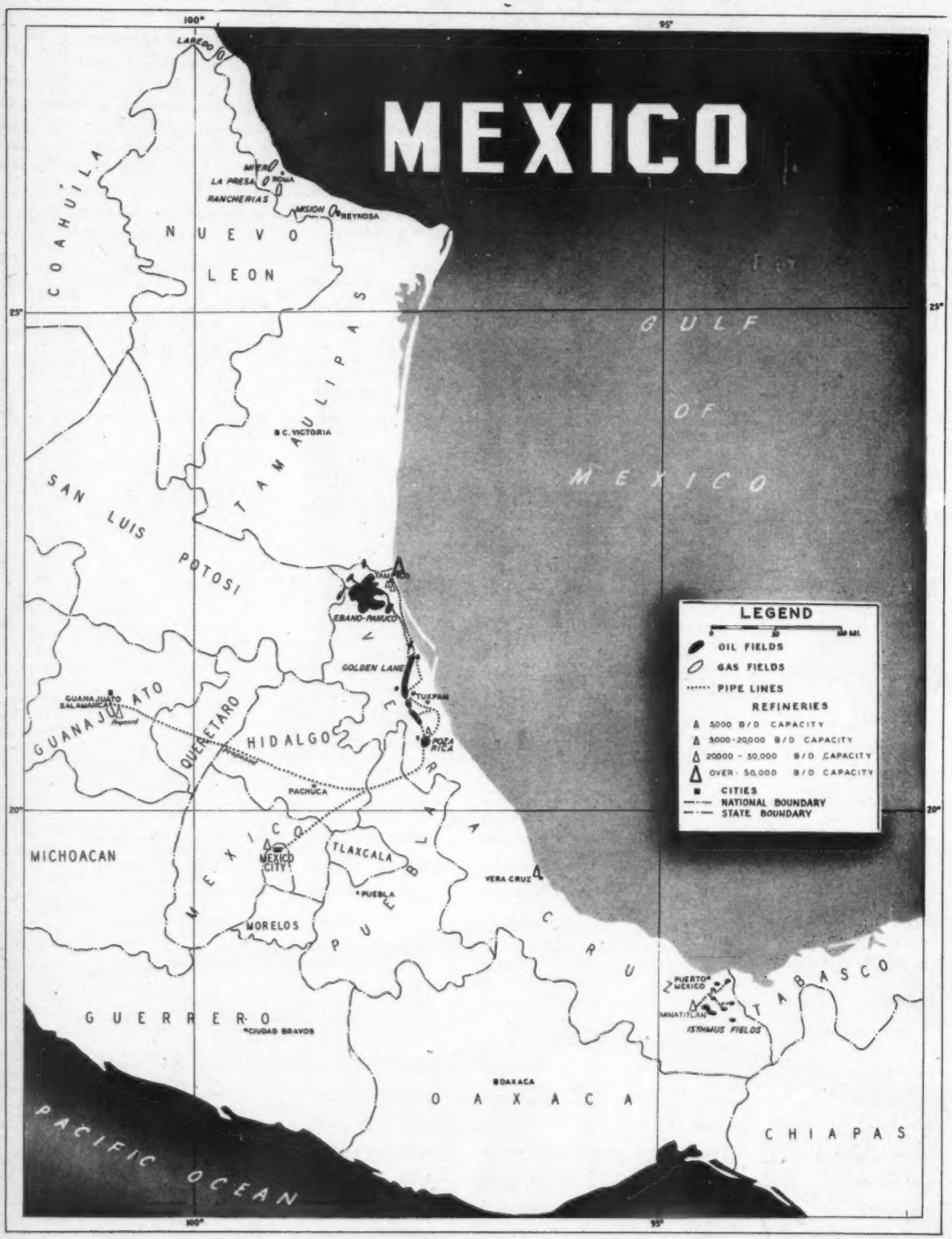
INDIA

Digboi	....	....	*207	500-5,600	5,000	.....	..	Miocene ss.	27°

*Includes some flowing wells.

IRAN

Agha Jari	1937	8	....	6,000-9,000	110,000	68,400,000	3	Asmari ls., Oligo-Miocene	36°
Gach Saran	1928	3	....	4,000-7,000	35,000	69,300,000	..	Asmari ls., Oligo-Miocene	31.1°
Haft Kel	1928	18	....	3,000-4,000	190,000	716,700,000	..	Asmari ls., Oligo-Miocene	39°
Masjid-i-Sulaiman	1908	25	....	2,000-3,000	50,000	775,400,000	..	Asmari ls., Oligo-Miocene	38°
Naft-i-Shah	1923	2	....	2,600-2,700	2,700	9,100,000	..	Kalhur ls., Oligo-Miocene	43°
Pazanun	1937	3	....	6,000-8,000	shut in	6,500,000	..	Asmari ls., Oligo-Miocene	66.4°
White Oil Springs	1908	1	....	5,700	17,000	10,900,000	1	Asmari ls., Oligo-Miocene	34°
Total		60	....		404,700	1,656,300,000	4		


MEXICO
GULF OF MEXICO
PACIFIC OCEAN
COAHUILA
NUEVO LEON
TAMAULIPAS
SAN LUIS POTOSI
GUANAJUATO
QUERETARO
HIDALGO
MICHOACAN
MEXICO
MORELOS
PUEBLA
TLAXCALA
VERACRUZ
GUERRERO
OAXACA
CHIAPAS
TABASCO
LAREDO
MIER
LA PRESA
RANCHERIAS
MISION
REYNOSA
CIUDAD VICTORIA
TAMPICO
EBANO-PANUCO
GOLDEN LANE
TUXPAN
POZA RICA
GUANAJUATO
SALAMANCA
PACHUCA
MEXICO CITY
CIUDAD BRAVOS
PUERTO MEXICO
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GAS FIELDS
PIPE LINES
REFINERIES
5000 B/D CAPACITY
5000-20,000 B/D CAPACITY
20000 - 50,000 B/D CAPACITY
OVER 50,000 B/D CAPACITY
CITIES
NATIONAL BOUNDARY
STATE BOUNDARY
100°
95°
25°
20°

IRAQ

Name of field—	Year of discovery	No. of prod. wells: Flowing	Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Kirkuk	1927	10	*10 ‡7	†2,750	90,000	342,000,000	2	Qarah Chauq ls., Eocene-Miocene	36°
Naft-Khaneh	1923	1	....	3,000	7,000	24,900,000	..	Kalhur ls., Oligo-Miocene	43°
Total		11	17		97,000	366,900,000	2		

*Shut in. †Average. ‡Observation.

ITALY

Bulk of the production comes from Vallezza field near Parma. A number of other small fields also are operated in Italy. Production in the Lodi district, where oil was discovered in 1943, is reported at 3,000 bbl. for the first 10 months of 1947. Data on three Italian fields, including Vallezza follow:

Centopozzi-Salsominore	1923	....	64	500-1,600	17	493,000	..	Tongrian, Oligocene	40°-43°
Vallezza	1909	....	151	1,600-2,400	93	897,000	2	Tongrian, Oligocene	50°
Vizzola	1942	3	1	1,900	9	17,000	1	Placentian, Pliocene	31°
Total		3	316		119	1,407,000	3		

JAPAN

Higashi-Nishti, Akita (Honshu)	1938	30	1,300	328	307,336	..	Lower Nanakuri, Tertiary	16°-19°
Higashiyama, Niigata (Honshu)	1873	499	1,000	190	6,685,000	..	Teradomari, Tertiary	26°-28°
Innai, Yamagata (Honshu)	1922	140	2,600-5,000	328	4,927,303	..	Katsurane, Tertiary	27°-37°
Ishinazaka, Yamagata (Honshu)	1944	16	650	310	112,766	..	Shibikawa, Tertiary	17°-19°
Katsurazaka, Yamagata (Honshu)	1928	27	3,100	100	237,221	..	Funakawa, Tertiary	16°-29°
Kurokawa, Niigata (Honshu)	1941	68	500	63	85,116	..	Yashiroda, Tertiary	19°-24°
Niitsu, Niigata (Honshu)	1874	846	1,000-4,500	320	16,163,702	..	Nishiyama-Shiya, Teradomari, Ter.	17°-35°
Nishiyama, Niigata (Honshu)	1898	248	3,300	156	14,753,554	..	Shiiya, Teradomari, Tertiary	15°-69°
Shibata, Niigata (Honshu)	1945	6	3,000	107	26,506	..	Yuetu group, Ter.	19°-40°
Yabase, Akita (Honshu)	1934	268	300-3,300	1,277	8,428,826	..	Sasaoka, Katsurane and Funakawa, Onnagawa, Tertiary	21°-40°
Total		2,146		3,179	51,727,230	..		
Other fields		2,051		636	24,822,348	..		
Total Japan		4,197		3,815	76,561,578	..		

KUWAIT

Burghan	1938	11	....	*3,815-4,525	60,600	13,015,000	5	Lower Cretaceous sandstone	31.5°33°

*Perforated intervals.

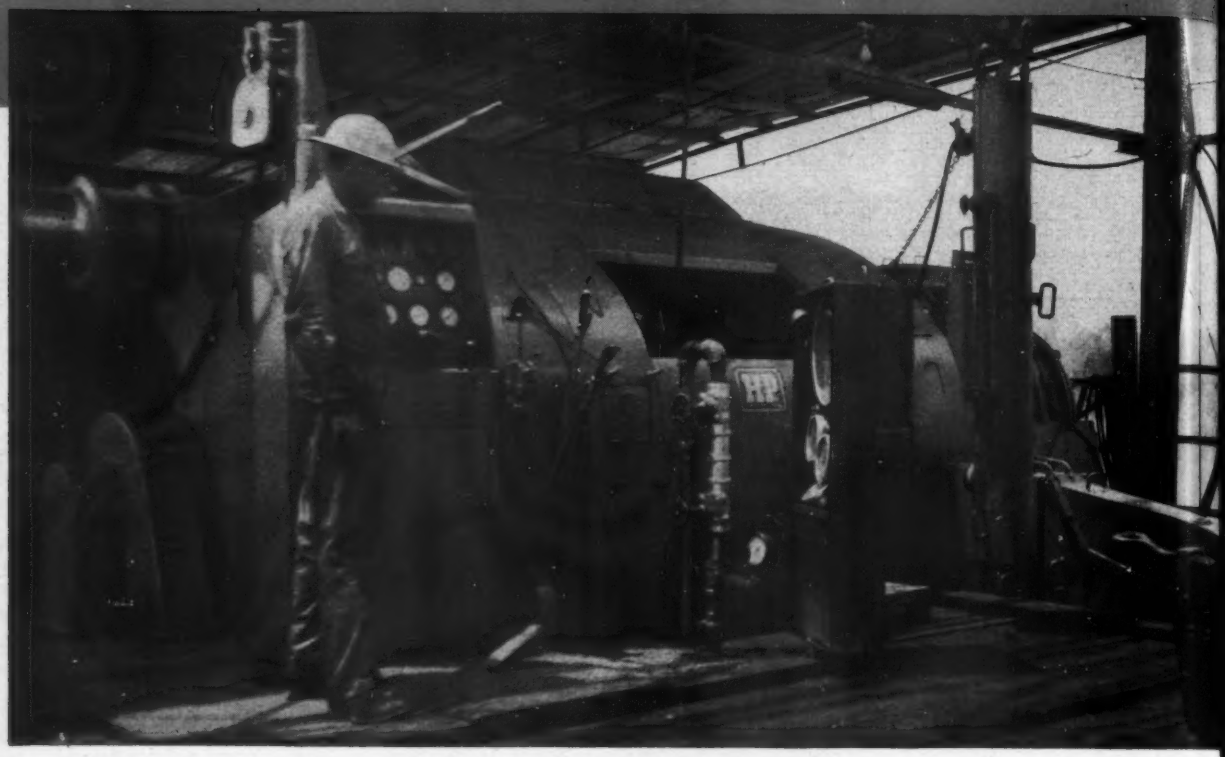
MEXICO

Northern zone:									
Poza Rica	1930	62	....	7,250	84,887	277,085,715	9	Tamabra lime (Cret.)	30°
Northern district (Ebano, Panuco, etc.)	1901	536	....	1,148	27,298	786,022,474	3	Tamaulipas and San Felipe ls. (Cret.)	12°
Southern district (Golden Lane)	1908	188	....	2,200	22,161	1,073,452,923	..	El Abra reef lime (Cret.)	20°
Other fields	....	2	....	.....	59	4,138,237	..	.....	....
Southern zone:									
Cuichapa-Acalapa	1934	7	5	2,100	1,155	1,904,926	..	Encanto sds. (Mio)	30°
El Burro	1930	....	28	2,460	1,767	16,488,131	..	Concepcion Inf. and Ensanto sds. (Mio.)	26°
El Plan	1931	34	38	5,734	12,385	59,584,989	3	Cedral, Lignitico, Filisola, Concepcion Sup., Concepcion Inf. and Encanto sands (Mio.)	24°-35°
Filisola	1921	....	38	1,585	733	20,903,051	..	Encanto sds. (Mio)	22°
Teapa Nuevo	1928	....	4	429	18	205,951	..	Encanto sds. (Mio.)	36°
Tonala	1928	....	72	1,640	1,982	44,772,603	..	Concepcion Inf. and Encanto sds. (Mio.), and Deposito sds., Olig.	28°
Other fields	....	....	1	.....	1	377,241	..	.....	....
Total		829	186		152,446	2,284,936,241	15		

NETHERLANDS

Schoonebeck (Coevorden)	1943	45	....	3,500	3,500	.....	..	Valanginian ss., Lower Cretaceous	28°

OUTSTANDING FEATURES...
THE "OILWELL" No. 96



Powerful, Fast and Responsive
BUILT FOR DEEP-WELL DRILLING

"Oilwell" No. 96 Draw Works is a major advancement in heavy-duty machinery for rotary drilling. The compact design permits ready transportation as a unit. Mounted on a sturdy skid base, the No. 96 can be skidded on a flat-bed truck and moved with transmission in place. All main shafts are supported by heavy duty roller bearings mounted in grease lubricated weatherproof housings for protection against dirt and mud. A hinged cover plate is provided to protect the control panel in transit.

The No. 96 has six forward hoisting speeds and two reverse; three forward rotary drive speeds and one reverse. Based upon 1,000 horsepower input, the line speed is 3,030 feet per minute in "hi-hi" and a line pull up to 102,400 pounds in "lo-lo" is available.

The design of the "Oilwell" No. 96 Draw Works is such that the "Oilwell"-Brantly Hydraulic Feed Control can be installed easily, as in the above photograph where this unit is mounted below the derrick floor. The guard of the feed control drive sprocket can be seen at the driller's end of the draw works.

Throughout the oil fields, the "Oilwell" No. 96 Mechanical Rig, with its ease of operation, is establishing new records in drilling speed and economy.

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UNITED STATES STEEL

"OILWELL"

PAKISTAN

(Present production approximately 1,000 bbl. per day)

Name of field—	Year of discovery	No. of prod. wells Flowing	Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
West Punjab:									
Balkassar	1946	....	....	8,400 max.	.....	.....	..	Eocene ls.	21°
Dhulian	1937	....	....	7,600 max.	.....	.....	..	Eocene ls.	37°
Joya Mair	1944	....	....	7,000 max.	.....	.....	..	Eocene ls.	19°
Khaur	1915	....	....	5,200 max.	.....	.....	..	Mainly Upper Tertiary ss.	35°

PERU

Agua Caliente	1937	7	....	900-1,100	280	338,000	..	Lower Cretaceous sand	44.4°
El Alto, Restin and Lobitos	1911 1902	37 26	594 199	1,500-6,500 2,000-6,500	4,400 } 2,100 }	63,912,560	13 3	Eocene ss. Eocene ss	34°-39° 34°-39°
La Brea-Parinas	1888	181	1,926	500-5,000	28,000	283,577,000	16	Verdun, Talara, Parinas, Pale Greda, Salina—Eocene ss.	34°-38°
Zorritos-Los Organos	1884	....	50	300-1,700	298	3,451,891	..	Eocene and Lower Miocene	33°-44°
Total		251	2,769		35,078	351,279,451	32		

POLAND

Detailed and current information on the status of Poland's crude-oil producing industry is meager. Prewar, the country produced more than 11,000 bbl. daily, but many of the most productive areas fell to Russia under the Potsdam agreement. Available data indicates Poland's current production is approximately 2,500 bbl. daily, all from fields in the southeast part of the country where the oil areas are divided into three administrative sectors: Gorlice, Krosno, and Sanok. Earlier in 1947, Poland was producing some 2,200 bbl. daily, indicating a gradual postwar expansion in output. Some 30 fields are listed for Poland but many are shallow and produce only a few barrels daily. At the end of June 1946, Poland was reported to have 2,251 wells—2,067 pumping, 177 bailed, 6 flowing, and 1 gas lift.

QATAR

Dukhan	1940	....	....	5,800-6,000	Three wells drilled prewar; potential on two, about 5,000 bbl. daily each; wells plugged; new development planned.		Kerkrit ls., Mesozoic		36°

ROMANIA

Complete information on Romania's present producing fields is not available. Present total production is about 80,000 bbl. daily. The following data are for a number of the country's major producing areas:

Avicesti	1921	....	....	5,500-7,400	.....	.....	..	Meotic, Pliocene	35°
Baicol	1861	....	....	600-8,800	.....	.....	..	Dacic and Meotic, Pliocene	39°
Boldesti	1922	....	....	6,900-7,900	.....	.....	..	Meotic, Pliocene	37°
Bucsani	1933	....	....	6,500-7,300	.....	.....	..	Meotic, Pliocene	38°

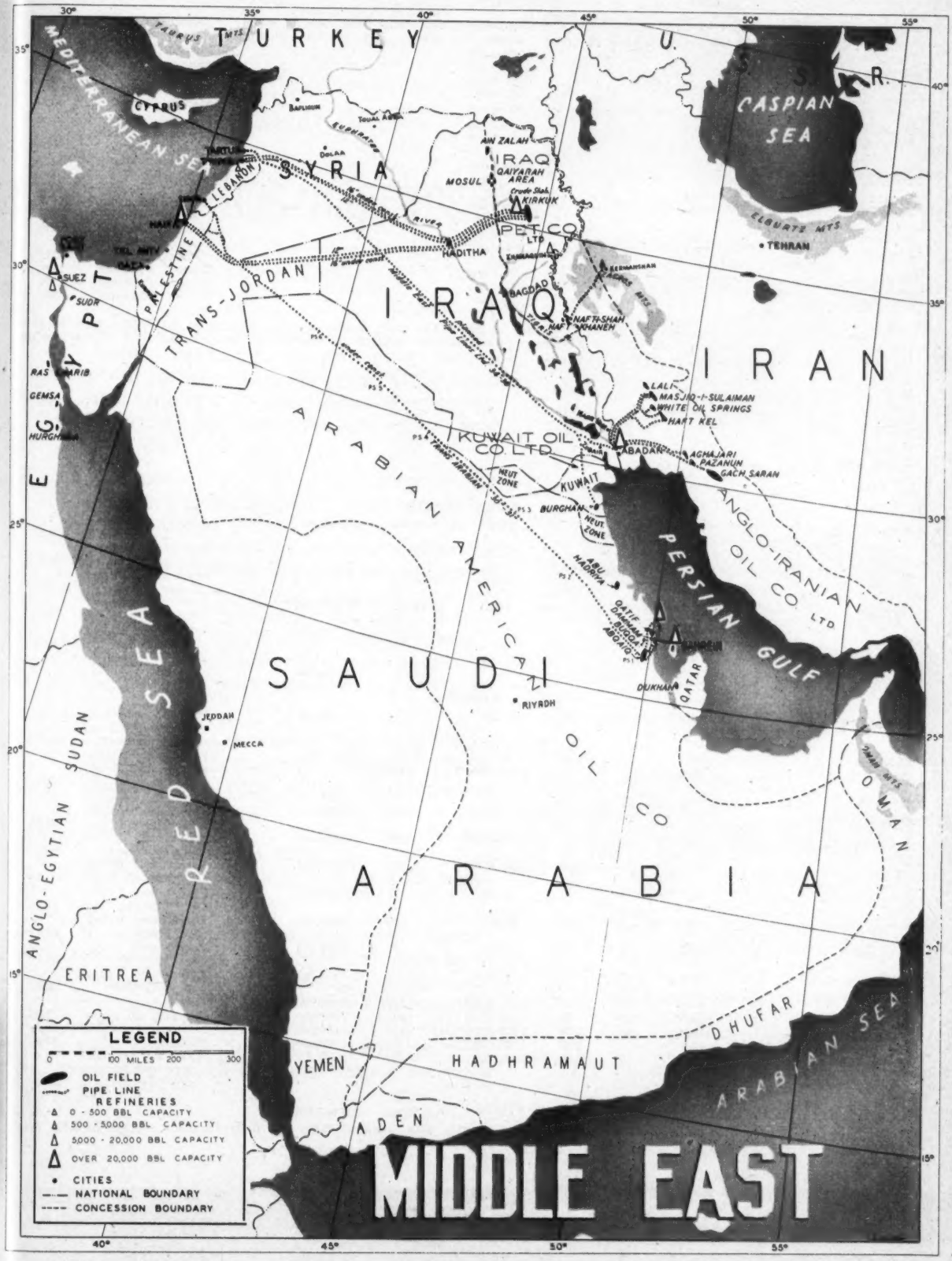
Moore

Big 129' & 136' Jackknife Masts for Deeper Drilling

Photograph shows a 136' Mast with capacity of 830,000 lbs., 137'2" clearance, 21'0" leg spread at base. Welded skid type substructure 8' high x 23' wide x 30' long, having 15' cellar span, and with continuous-level draw works power skid type support 20' long x 23' wide. Specifications of 129' Mast same except capacity is 563,000 lbs.

Write for specifications.

LEE C. MOORE CORPORATION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ROMANIA (Continued)

Name of field—	Year of discovery	No. of prod. wells Flowing	Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Calinesti	1934			5,300-5,700				Meotic, Pliocene	33°
Ceptura	1913			2,400-4,100				Meotic, Pliocene	34°
Ditesti-Floresti	1933			6,900-7,300				Meotic, Pliocene	39°
Gura Ocnitei	1924			715-3,537 2,697-6,138				Dacian, Pliocene Meotic, Pliocene	23° 36.6°
Harsa	1934			7,218-8,530				Meotic, Pliocene	36.2°
Margineni	1935			6,100-7,500				Meotic and Helvetian, Pliocene	39°
Moreni	1903			1,400-5,600				Dacic and Meotic, Pliocene	33°
Opariti	1942			2,165				Meotic, Pliocene	29.3°
Pacureti	1899			2,000-4,000				Dacic, Pontuc and Meotic, Pliocene	52°
Pitigaia	1938			4,400-4,600				Meotic, Pliocene	36°
Piscuri	1927			1,200-4,000				Dacic and Meotic, Pliocene	33°
Tintea	1903			2,132-5,905 6,824-10,494				Dacian, Pliocene Meotic, Pliocene	35° 39°
West Gura Ocnetei	1929			5,400-5,900				Meotic, Pliocene	33°

Romanian production in June 1947 was reliably reported at 79,700 bbl. daily against slightly more than 85,000 bbl. daily in 1946 and 135,000 bbl. daily in 1938. Reports indicate Romanian production has declined further in the last half of 1947. The following table gives June 1947 production by principal districts:

Baicoi					18,400				
Boldesti					8,400				
Ceptura					8,600				
Gura					13,250				
Moreni					13,400				
Ochiuri					10,900				
Other areas					6,750				
Total					79,700				

SAUDI ARABIA

Abqaiq	1940	23		6,900	160,000	45,000,000	4	Arab. zone, Upper Jurassic ls.	37.5°
Abu Hadriya	1940	1		10,220	Not prod.			Hadriya zone, Upper Jurassic ls.	35.5°
Buqqa	1947	2		7,169	Not prod.		1	Arab zone, Upper Jurassic ls.	35°
Dammam	1936	33		4,900	100,000	105,000,000		Arab zone, Upper Jurassic ls.	35°
Qatif	1945	1		7,500	4,500	1,700,000	2	Arab zone, Upper Jurassic ls.	37°
Total		60			264,500	151,700,000	7		

TRINIDAD

Barrackpore	1918	8	26	†1,700	1,150	6,138,026	1	Miocene (Barrackpore and Wilson) and Oligocene	27.5°
Brighton	1910	*17	*28	700-3,000	*1,230	*5,713,979		Forest ss., Miocene	18°
Coora-Quarry	1936	*102	*123	1,200-6,500	*850			Forest and Cruse ss., Miocene	26°
Cruse	1913	41	44	†2,830	2,140	13,780,378		Cruse ss., Miocene	20.7°
Forest Reserve	1914	127	205	†2,625	15,675	83,101,806	4	Forest and Cruse ss., Miocene	23.9°
Fyzabad	1920	*74	*180	300-8,000	*8,500	*91,453,894		Forest and Cruse ss., Miocene	24°
Guapo		*146	*178	1,500-5,700	*11,260	*63,085,488		Forest and Cruse ss., Miocene	16°-24°
Guayaguayara	1902	24	47	†2,630	1,207	7,958,072	1	Forest and Cruse ss., Miocene	31.2°
Morne Diablo	1936	3	19	†3,560	309	2,067,201		Forest and Cruse ss., Miocene	25.4°
Quinam	1936	2	9	†4,220	177	1,068,778		Forest and Cruse ss., Miocene	31.1°
Palo Seco	1934	13	7	4,116	428	3,672,301	1	Forest and Cruse ss., Miocene	28.9°
Parrylands	1913	*18	*12	2,000-4,000	*1,159	*19,000,000		Miocene	20.6°
Pinal	1935	*19	*30	1,300-8,500	*4,845	*7,000,000		Miocene, Oligocene	22.8°
Point Fortin	1908	*96	*56	1,800-6,800	*7,629	*27,000,000		Miocene	22.1°
San Francique	1922		*16	1,000-2,800	*324	*4,000,000		Miocene	22.8°
Wilson	1918	6	19	†2,950	889	*2,507,820		Miocene (Barrackpore and Wilson) and Oligocene	21.5°
Total		696	999		57,767	337,547,743	7		

Official figures show the production of crude oil in Trinidad in 1946 averaged 55,432 bbl. daily from an average of 1,820 producing wells.

*1946 data. †Average.

UNITED KINGDOM

England

Caunton	1943		12	2,000-2,200	60	133,000		Upper Millstone grit series ss., Upper Carboniferous	28.7°
Dukes Wood	1941		112	1,800-2,500	430	1,656,000		Upper Millstone grit series ss., Upper and Lower Carb.	34°

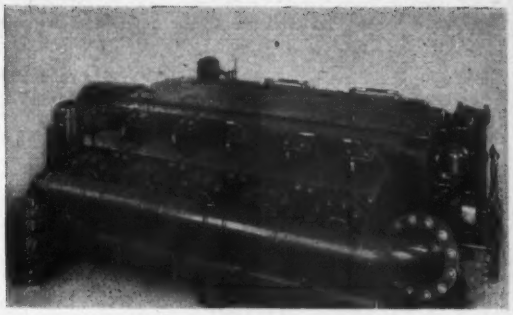
A lot has happened

THE past year has been a particularly eventful one at Cooper-Bessemer. Important developments and new, unique products now fully proved, have been born, ready *now* to improve your operations and to save you money as time goes on.

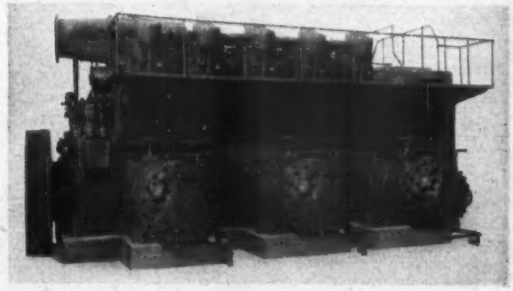
For example, we've introduced the world's mightiest angle compressor, our space-saving, 240-hp-per-cylinder GMW. We've developed a new family of motor-driven compressors, the JM line, designed to save you plenty in maintenance, operating and housing cost. Then there's the announcement of our sensational development that raises gas-Diesel efficiency to an undreamed-of high, regardless of load.

And last but not least, there's our fully proved but brand new family of Twin-Line liquid pumps with their unequaled efficiencies, amazing compactness and suitability for economical, direct-connected engine drive. Here's a pump that's bound to go places with its many unique advantages.

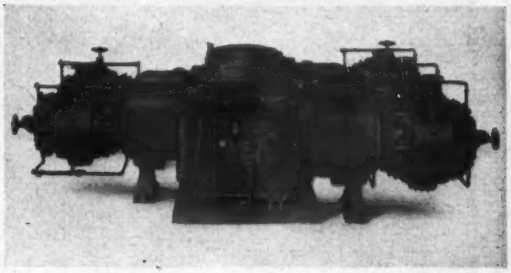
If our published announcements escaped your attention, if you don't already have complete data on these major developments, get in touch with the nearest Cooper-Bessemer office. We'll gladly give you bulletins or detailed information on any or all of these important new products.



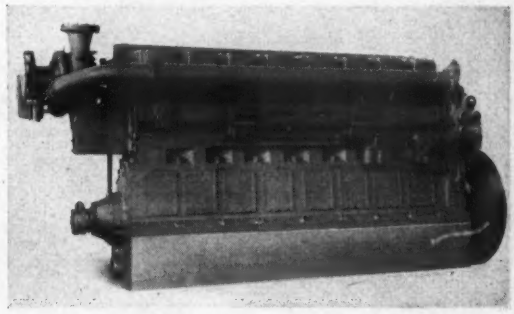
Revolutionary Twin-Line Liquid Pump



GMW—world's most powerful angle compressor



JM—compact, space-saving motor-driven compressor



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UNITED KINGDOM (Continued)

Name of field—	Year of discovery	No. of prod. wells Flowing	No. of prod. wells Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Eakring	1939	....	56	1,800-2,500	290	1,021,000	..	Upper Millstone grit series ss., Upper Carboniferous	34°
Formby	1939	....	8	85-130	8	55,000	1	Keuper ss., Triassic	34.6°
Kelham Hills	1941	....	54	2,000-2,200	210	756,000	..	Upper Millstone grit series ss., Upper Carboniferous	28.7°
Scotland									
Midlothian	1938	....	2	1,750	2	16,000	..	Dalkieth, Carb.	40°
Total		....	244		1,000	3,637,000	1		
VENEZUELA									
Amana	1928	....	....	3,281	.....	38,550	..	Mostrenco (Eocene)	31.5°
Anaco	1940	....	....	9,843	.....	7,504	..	Oficina (Miocene-Oligocene)	43.5°
Bachaquero	1930	306	2	3,445	85,603	67,892,884	10	Lagunillas, La Rosa (Miocene); Icotes (Oligocene)	15°
Cabimas	1917	177	757	2,198	88,112	540,577,493	.	Lagunillas, La Rosa (Miocene); Icotes (Oligocene)	24°

VENEZUELA (Continued)

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Capacho	1945	....	....	4,429	.....	7,032	..	.....	23°
Cumarebo	1931	33	17	1,969	5,120	37,043,402	1	Damsite and Socororo (Miocene)	47.7°
El Cubo	1916	27	89	820	13,051	102,426,972	..	Third horizon of Carb. and Mirador (Eocene)	31°-35°
El Roble	1939	11	....	10,499	3,862	12,668,619	2	Oficina (Miocene-Oligocene)	36.5°
El Totumo	1914	....	....	1,550-3,100	.....	24,253	..	.....	22°
Grico	1946	....	....	4,000	.....	.....	..	La Pascua sand (Oligocene)	30°
Guanoco	1913	....	...	459	.....	1,718,918	..	Upper Cretaceous	...
Guara	1942	153	5	492	79,074	66,991,846	7	Oficina (Miocene-Oligocene)	38.3°
Guario	1940	15	....	6,562	6,875	5,713,721	1	Oficina (Miocene-Oligocene); Merecure (Eocene)	43.7°
Guico	1944	43	....	6,070	17,303	11,147,009	4	Oficina (Mio-Oligocene)	38.4°
Hombre Pintado	1927	1	22	1,969	767	3,818,691	..	Agua Clara (Oligocene)	34.3°

VENEZUELA (Continued)

Name of field—	Year of discovery	No. of prod. wells: Flowing	No. of prod. wells: Pumping	Producing depth	Daily avg. production (bbl.)	Accumulative production 7-1-47 (bbl.)	Wells drilling	Name and type of formation	Gravity °A.P.I.
Jusepin	1938	321	....	4,265	51,425	83,710,542	3	La Pica (Miocene); Carapita (Oligocene)	32.8°
La Ceiba	1945	1	....	.....	176	76,929	..	Oligocene	36.6°
La Concepcion	1925	3	80	3,150	2,944	30,772,999	1	Concepcion (Eocene)	36.5°
Lagunillas	1926	207	1,014	2,999	310,158	1,459,045,830	6	Lagunillas and La Rosa (Miocene)	19°
Las Mercedes	1942	43	....	4,265	151	143,833	3	La Pascua (Miocene-Oligocene); Cretaceous	30.1°
Las Ollas	1940	....	....	7,379	.....	4,648	..	Miocene	48°
La Paz	1925	11	....	4,265	75,539	45,564,549	1	Concepcion (Eocene); Guasare, La Luna, Cogollo (Cretaceous)	34.7°
Las Palmas	1929	....	....	2,100-5,400	.....	433,945	..	.....	31.8°
Leona	1938	14	1	5,906	4,403	5,963,422	..	Oficina (Miocene-Oligocene)	28.9°
Los Barrosos	1922	....	....	.....	.....	.....	..	Eocene	16°-22°
Los Caritos	1940	1	....	5,676	208	208,214	..	Oficina (Miocene)	30.5°
Mara	1945	5	....	5,250	21,058	8,457,917	4	La Luna and Cogollo (Cretaceous)	30.1°
Mata Grande	1946	....	....	4,593	19	40,462	3	La Pica (Miocene); Carapita (Oligocene)	27°
Mene de Acosta	1929	....	....	2,625	.....	778,042	..	Oligocene	35°
Mene Grande	1914	67	192	4,134-7,546	37,858	297,790,696	1	Terciario Joven and Pauji (Eocene); Misoa Trujillo (Eocene)	17° 21°
Mene Mauroa	1921	6	16	984	440	24,472,059	..	Agua Clara, Oligocene	32.3°
Merey-Aero	1934	....	....	4,593	.....	66,998	..	Middle Miocene	13°
Misoa	1921	....	....	.....	.....	.....	..	Eocene	15°
Monte Claro	1926	....	....	.....	.....	.....	..	Miocene-Oligocene	35°
Mulata	1941	149	....	4,593	23,612	32,884,105	4	La Pica (Miocene)	33.2°
Muri	1942	55	....	3,609-4,593	4,604	8,703,511	..	La Pica (Miocene)	32°
Netick	1929	1	1	6,234	258	472,715	1	Horqueta (Eocene)	28°
Nipa	1945	17	....	7,546	10,667	2,563,638	9	Miocene	
Oficina	1937	137	45	5,118	42,279	114,673,597	2	Oficina (Mio-Oligocene)	31.6°
Orocual	1933	....	....	3,182	.....	29,530	..	Miocene	13.5°
Palacio	1946	....	....	3,400	.....	.....	..	La Pascua sand (Oligocene)	30°
Pedernales	1936	....	....	1,571	.....	9,035,909	..	La Pica (Miocene)	20.6°
Pilon	1936	....	....	3,370-3,525	.....	.....	..	Miocene	14°
Pirital	1945	1	....	4,544	44	64,891	..	La Pica (Miocene)	32.7°
Pueblo Viejo	1940	18	1	1,969	6,258	5,746,465	3	Misoa (Eocene)	20°
Quiamare	1942	1	....	6,463	239	573,614	..	Miocene-Oligocene	38.7°
Quiriquire	1928	46	218	3,281	52,318	268,081,480	6	Quiriquire (Pliocene)	19.6°
Rincon Largo	1935	4	....	7,710	2,296	2,049,970	..	Oficina (Miocene-Oligocene)	42°
San Joaquin	1939	26	....	3,609-9,186	10,340	19,647,727	1	Oficina (Miocene-Oligocene)	43.7°
Santa Ana	1936	2	....	8,268	654	1,112,786	2	Oficina (Miocene-Oligocene); Merecure (Eocene)	37°
Santa Barbara	1941	175	12	5,343	28,719	40,544,293	5	La Pica (Miocene)	31.9°
Santa Rosa	1941	6	....	6,562	2,604	3,245,535	2	Oficina (Miocene-Oligocene)	45.6°
Socorro	1940	....	....	4,003	.....	12,233	..	Miocene	27.5°
Tabasca	1935	....	....	4,199	.....	45,770	..	Miocene	14.5°
Temblador	1936	68	....	3,806	6,447	23,615,993	..	Oficina (Miocene-Oligocene)	21.6°
Tia Juana	1928	199	280	2,999	167,721	453,980,155	1	Lagunillas and La Rosa (Miocene); Potreritos (Eocene)	17°
Travieso-2	1945	8	1	3,773	748	464,419	..	La Pica (Miocene)	31°
Tucupido	1946	1	....	5,446	.....	7,661	..	Roblecito (Miocene)	40.5°
Tucupita	1945	12	....	5,610	3,522	1,196,068	3	Freites (Miocene)	16.5°
Uracoa-Tabasca	1937	....	....	4,298-4,373	.....	.....	..	Miocene-Oligocene	15°
Yopales	1937	5	....	4,167	2,019	594,823	..	Miocene	29.8°
Total		2,376	2,753		1,169,495	3,796,954,867	86		

In the central Magdalena valley, Colombia, Tropical Oil Co. in its large Infantas-La Cira fields efficiently dehydrates and desalts crude oil in these large centralized treating installations

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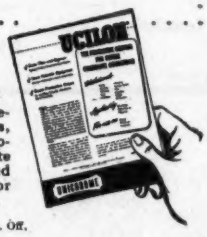

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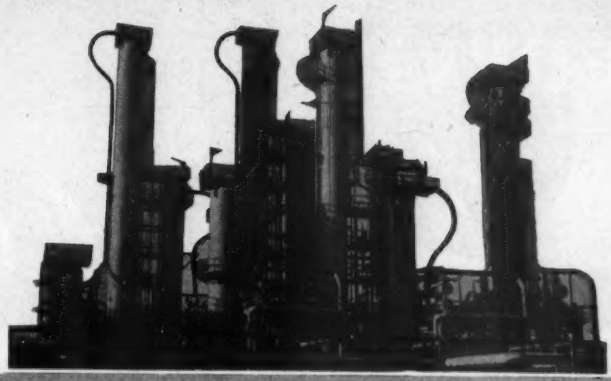

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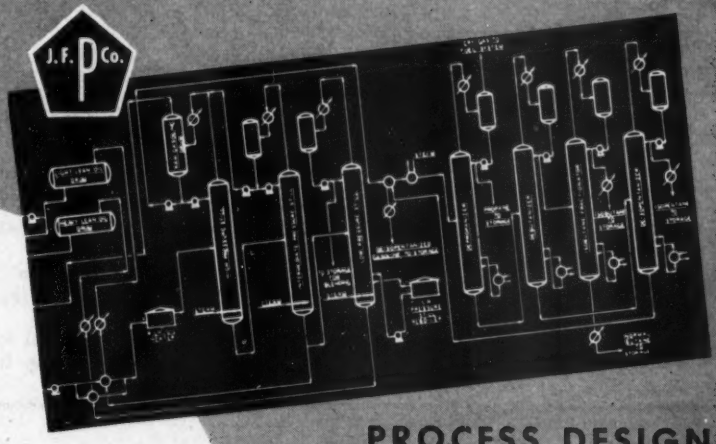

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SURVEY of World Oil Refineries

SUMMARY OF FOREIGN REFINING CAPACITY (EXCLUDING U.S.S.R.)

	Number refineries	Crude capacity (bbl. dly.)	Cracking capacity (bbl. dly.)
Argentina	17	98,675	58,630
Australia	4	10,155	.....
Austria	8	16,570	.....
Bahrein	1	125,000	23,600
Belgium	7	15,150	2,000
Bolivia	2	1,227	.....
Brazil	3	5,900	.....
Burma	...	.....	.....
Canada	31	252,150	119,500
Canary Islands	1	12,000	5,000
Colombia	2	16,700	.....
Cuba	4	5,300	1,100
Denmark	1	475	.....
East Indies:			
Borneo	4	14,000	2,000
Sarawak	1	20,000	.....
Sumatra	3	79,300	21,700
Total East Indies	8	113,300	23,700
Ecuador	2	3,800	.....
Egypt	2	36,750	7,000
Eire	1	650	.....
France	16	193,000	70,700
Germany	9	24,000	.....
Hungary	8	13,350	350
India	1	5,750	1,500
Iran	2	422,100	125,000
Iraq	2	8,400	.....
Italy	7	33,400	12,100
Japan	17	40,400	2,950
Mexico	7	175,000	27,000
Netherlands	1	14,000	16,500
Netherlands West Indies:			
Aruba	2	380,000	203,000
Curacao	1	200,000	100,000
Total N.W.I.	3	580,000	303,000
Palestine	1	63,000	33,000
Pakistan	1	4,800	2,000
Peru	3	30,000	6,600
Portugal	1	700	.....
Poland	6	7,100	.....
Romania	16	193,500	50,000
Saudi Arabia	1	115,000	14,000
Spain	1	700	.....
Sweden	2	5,000	2,700
Trieste	2	12,000	.....
Trinidad	5	96,300	50,000
United Kingdom:			
England	11	69,550	11,000
Scotland	3	12,000	3,000
Wales	1	11,000	4,000
Total United Kingdom	15	92,550	18,000
Uruguay	1	6,300	2,000
Venezuela	11	116,100	24,000
Yugoslavia	5	8,300	.....
Total foreign (excluding Russia)	238	2,974,552	1,001,930

ARGENTINA

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
"Astra" Compania Argentina de Petroleo, S. A., Avenida Alem 621 (R.I.), Buenos Aires	Comodoro Rivadavia (shut down)	2,500	S	None
	Comodoro Rivadavia	6,000	L-A	3,500
Cia. Ferrocarrilera de Petroleo, Peaseo Colon 185, Buenos Aires	Wilde (Buenos Aires)	500	S-L	None
Cia. General Asfaltos, Buenos Aires	Campana	15,000	L-A	8,000
Cia. Nativa de Petroleos, S.A., Av. Roque Saenz, Pena 567, Buenos Aires	Manuel	1,000	S	None
	Plaza Huincul	400	S	None
	Puerto Galyan (Bahia Blanca)	3,500	A	1,850
Cia. La Isaura, S.A., Ave. Pte. R.S., Pena 699 Buenos Aires	Bahia Blanca (shut down)	2,200	S	None
Cia. Condor, Levalle 27, Avellaneda	Avellaneda, Buenos Aires	1,300	S-L	None
Diadema Argentina, S.A., de Petroleo (Shell), Av. Roque Saenz, Pena 788, Buenos Aires	Buenos Aires	12,000	S-C	9,000
Lottero-Papinia y Cia., Avellaneda	Avellaneda (Buenos Aires)	300	S-L	None
Ultramar, S.A., Petroleo Argentina, Av. Alem 619, Buenos Aires	Avellaneda (Dock Sud)	6,000	L	2,800
	La Plata	30,000	Comp.	23,000
Yacimiento Petroliferos Fiscales, R.S. Pena 777, Buenos Aires	San Lorenzo	9,500	S-C	6,200
	Plaza Huincul	1,575	S	570
	Mendoza	5,000		2,760
	Tres Cerrillos	1,900		950
Total Argentina		98,675		58,630

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AUSTRALIA

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Bitumen Oil & Refining Co. (Caltex Pty., Ltd., subsidiary), 115 Pitt St., Sydney	Sydney (under const.)	1,000		None
Commonwealth Oil Refineries, Ltd., 90 William St. Melbourne, C.1, Victoria	Laverton, Victoria	2,855	S	None
Shell Co. of Australia, Ltd., Shell Corner, 163 William St., Melbourne, C. 1, Victoria	Clyde, N. S. W.	5,000	S	None
Vacuum Oil Pty., Ltd. (Standard-Vacuum subsidiary), 29 Market St., Melbourne	Paisley	1,300	L-S	None
Total Australia		10,155		

Note.—In addition, Australia also has shale-oil refining at the plant of National Oil Refineries, Ltd., at Glen Davis, N. S. W., with a capacity of 300 bbl. daily.

AUSTRIA

A.G. der Shell-Floridsdorfer Mineral oel-Fabrik, Schubertring 14, Vienna 1	Floridsdorf	2,500	L-A	None
Creditul Minier Oesterreichlische-Rumanische, Petroleum-Vertriebs-Ges., Bulevardul Bratianu 16, Bucharest, Romania	Korneuburg	2,400	S	None
	Droesing	1,000	S	None
Donau-Oel-Tank-Lager, G.M.B.H., Vienna	Moosbierbaun	2,250	S	None
Elwerath-Wintershall I.G. Farbenindustrie (Socony-Vacuum and Shell), Vienna	Lobau	3,800	S	None
Nova Oel—und Brennstoff A.G., Vienna	Schwechat	2,000	S	None
Oesterreichische Fanto, A.G., Kerrengasse, 17, Vienna	Lanzendorf	1,120	S	None
Vacuum Oil Co., A. G., Schwarzenbergplatz, 18, Vienna	Kagran	1,500	S	None
Total Austria		16,570		

BAHREIN

Bahrein Petroleum Co., Ltd., 551 Fifth Ave., New York 17	Bahrein Island, Persian Gulf	125,000	S-C*	23,600
Total Bahrein		125,000		23,600

*Asphalt-manufacturing facilities are to start early in 1948. Cracking facilities include two U.O.P. thermal units with total capacity 13,600 bbl. daily and one U.O.P. fluid catalytic unit 10,000 bbl. daily. The catalytic unit is now shut down.

BELGIUM

Belgian Shell Co., 47 Canterstun, Brussels	Ghent	2,300	L-A	None
Belgo Petroleum Co., Terdonck	Terdonck	1,200	S-C	1,000
Cie. Industrielle Atlas, 101 Avenue de France, Antwerp	Hoboken (near Antwerp)	1,850	S	None
Raffinerie Belge de Petroles, 116, Avenue de France, Antwerp	Antwerp*	3,800	S	None
Raffinerie et Distilleries Anversoises, Antwerp	Antwerp	2,000	S	None
Redeventza Ste. Ame. Belge, Antwerp-Kiel	Antwerp-Kiel	3,000	S-C	1,000
Tankage et Transport, S.A., 10, Place Leopold, Antwerp	Antwerp-Kiel	1,000	S	None
Total Belgium		15,150		2,000

*This plant, as are several other Belgium refineries, is engaged in repairing war-damaged facilities. Expansion planned by Raffinerie Belge de Petroles, for the 1947-48 period, include a 2,000-bbl. daily topping-distillation unit, vacuum-distillation unit, reforming plant, and tanks and auxiliary equipment.

BOLIVIA

Yacimientos Petroliferos Fiscales Bolivianos, P.O. Box 401, La Paz	Camiri	818	S	None
	Sandita	409	S	None
Total Bolivia		1,227		

Note.—Yacimientos Petroliferos Fiscales Bolivianos in June signed a contract with Foster Wheeler Corp. for the construction of two other refineries. One will be a topping-reforming plant of about 5,000 bbl. daily capacity at Cochabamba which will produce aviation gasoline along with other products; the other at Sucre will be a skimming plant with a capacity of 2,000 bbl. daily. A 6-in. pipe line from Camiri to Cochabamba with a branch from Zudanez to Sucre is now being built.

BRAZIL

Conselho Nacional do Petroleo, Av. Presidente Wilson, 164, Rio de Janeiro	Aratu, Bahia	150	S	None
Industrias Matarazzo de Energia, S. A. "IME" Predio Conde Matarazzo, Sao Paulo	Sao Caetano	3,500	S	None
Ipiranga S.A. Cia. Brasileira de Petroleas, Saco de Mangueira sem numero, Rio Grande	Rio Grande	2,250	S	None
Total Brazil		5,900		

Note.—A new refinery, to handle total 2,500 bbl. daily of indigenous crude, is to be constructed in 1948 in the State of Bahia. A Brazilian company, Refineria de Petroleos do Distrito Federal, S. A., is also reported to be planning the construction of a 10,000-bbl. refinery near Rio de Janeiro which would handle Saudi Arabian or Venezuelan crude.

BURMA

The three refineries operated prewar in Burma all were destroyed to prevent them from falling into hands of the Japanese. These refineries were all located near Rangoon. Principal one was the Syriam plant of 20,000-bbl. crude capacity and 3,000-bbl. cracking capacity, Burmah Oil Co., Ltd., 175 West George St., Glasgow C. 2, Scotland, is now making preparations for the reconstruction of this refinery. The other two prewar Burma plants were those of British Burmah Petroleum Co., Ltd., Cross Keys House, 56 Moorgate, London—Seikkyi of 3,500-bbl. daily crude capacity, and Thilawa of 2,500-bbl. daily crude capacity.

CANADA

A detailed listing of operating refineries in Canada was published on page 287 in The Oil and Gas Journal's annual Refining Number, March 22, 1947. The data showed 31 Canadian refineries exclusive of small topping plants with a total capacity of		252,150		119,500

Note.—The 1948 survey will be published April 1, 1948

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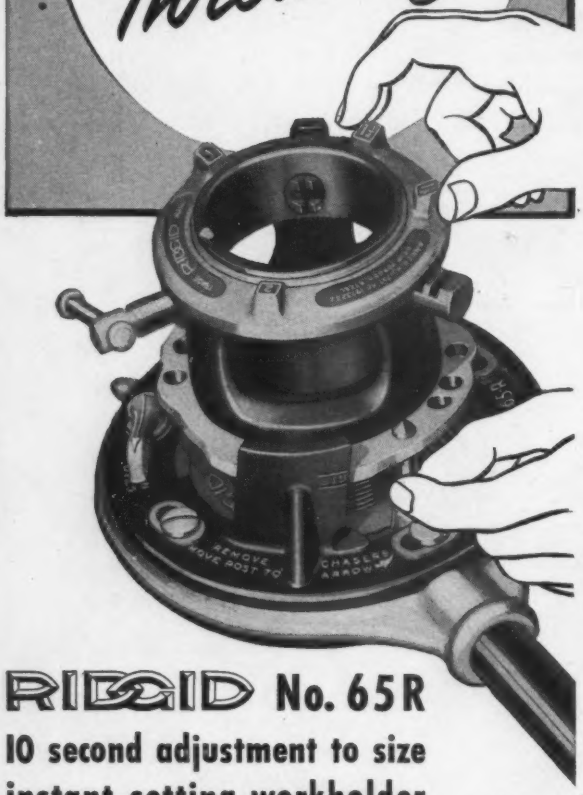

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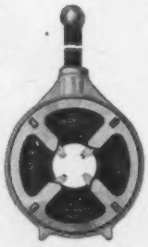

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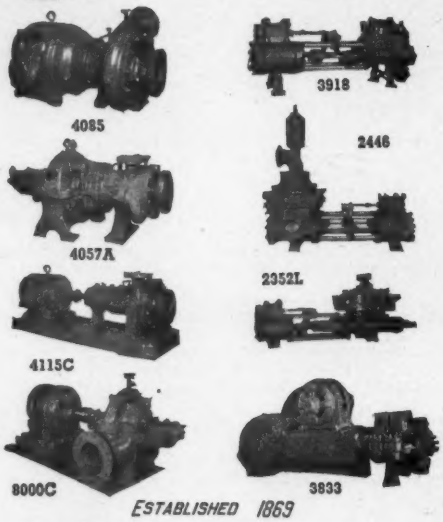

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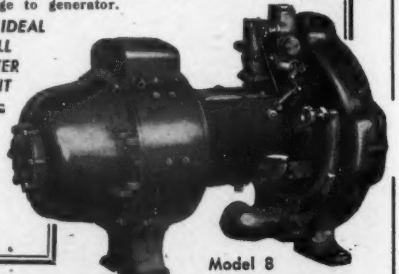

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CANARY ISLANDS (Spain)

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Cia. Espanola de Petroleos, S.A., Alcala, 31, Madrid	Sta. Cruz de Tenerife	12,000	A	5,000
Total Canary Islands (Spain)		12,000		5,000

Note.—Work is scheduled to start in 1948 to increase production of this refinery by about 50 per cent.

COLOMBIA

Colombian Petroleum Co., Cucuta, Colombia	Petrolea	700	S	None
Tropical Oil Co., Apt. 170, Via Cartagena, El Centro	Barrancabermeja	16,000	L-A	None
Total Colombia		16,700		

CUBA

Cia. Cubana de Petroleo, S. A., Havana	Havana	500	S	None
Standard Oil Co. of Cuba, Havana	Belot	4,000	L-A	1,100
Destiladora Jarahueca	Santa Clara	200		
Cia Petrolera Jarahueca	Jarahueca	600		
Total Cuba		5,300		1,100

DENMARK

A/S Kalundborg Olieraffinaderi, Ostre Hauneveg, Kalundborg	Kalundborg	475	A	None

EAST INDIES

Borneo

De Bataafsche Petroleum Mij. (Shell), Carl van Bijlandtlaan 30, The Hague	Balikpapan	8,500	S-L	None
De Bataafsche Petroleum Mij., Carl van Bijlandtlaan 30, The Hague	Wonokromo	2,000	S	None
	Tjepoe (shut down)	3,000	S-C	2,000
Standard-Vacuum Petroleum Mij., Soengei Gerong, Palembang, Sumatra	Kapoean (shut down)	500	S	None
Total Borneo		14,000		2,000

Sarawak

Sarawak Oilfields, Ltd. (Shell), Miri, Sarawak	Lutong*	20,000	S	None

Sumatra

De Bataafsche Petroleum Mij. (Shell), Carl van Bijlandtlaan 30, The Hague	Pangkalan	19,300	S	None
	Pladjoe†	40,000	S-C-L	7,700
Standard-Vacuum Petroleum Mij., Seongei Gerong, Palembang, Sumatra	Palembang‡	20,000	S-C-W	14,000
Total Sumatra		79,300		21,700
Total East Indies		113,300		23,700

‡To 45,000 end of 1948 and cracking to 32,000. †50,000 in 1948. *Royal Dutch-Shell has disclosed that plans have been completed for the construction of a modern refinery on the Island of Maura in Brunei Bay which will replace the Lutong refinery. The Lutong refinery has been shut down while rehabilitation of war damage was carried out.

ECUADOR

Anglo-Ecuadorian Oilfields, Ltd., Ancon, Santa Elena	La Libertad*	2,800	L	None
Ecuador Oilfields, Ltd., Apt. 865, Guayaquil	Cuativo	1,000	S	None
Total Ecuador		3,800		

*Capacity of this refinery to be increased during 1947-48 to 4,000 bbl. daily.

EGYPT

Anglo-Egyptian Oilfields, Ltd., St. Helens Court, London, E.C. 3, England	Suez	35,000	A	7,000
Raffinerie de Petrole du Government, 18 Rue Fouad Ier, Alexandria	Suez	1,750	S	None
Total Egypt		36,750		7,000

EIRE

Cork Harbour Oil Wharves, Ltd., Haulbowline Island, Co. Cork	Haulbowline Island, Co. Cork	650	S	None

FRANCE

Brest Port Petrolier (Pechelbronn Ste. Ame. d'Exploitations Minieres subsidiary, 32 Allee de la Robert Sau, Strasbourg	Brest	2,000	S	None
Cie. des Produits Chimiques et Raffineries de Berre, 55 Rue d'Amsterdam, Paris 8	Berre l'Etang (Marseille)	16,500	Comp. Cross Houdry	2,500 5,500
Cie. Industrielle des Petroles, S.A.F., 46, Rue de Courcelles, Paris (Socony-Vacuum)	Frontignan (Herault) (shut down*)	*1,300	L	None
Cie. Francaise de Raffinage, 11, Rue du Docteur, Lanceraux, Paris	Gonfreville-l-Orcher* (La Havre)	25,500	W-A	Cracking & reforming, 13,400. vis-breaking, 6,500
	La Mede-Martigues* (Marseille)	23,200	A	Cracking & reforming, 11,500, vis-breaking, 5,600
Les Propetrol Consommateurs de Petrole (affiliated French railroads), Paris	Donges (St. Nazaire)	3,500	S-L	None

FRANCE (Continued)

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Pechelbronn Ste. Ame. d'Explorations Minieres, 32 Allee de la Robert Sau, Strasbourg	Merkwiller-Pechelbronn	1,500	S	None
Raffineries de la Vacuum Oil Co., S.A.F., 46, Rue de Courcelles, Paris	Notre-Dame-de-Gravenchon (Rouen)	11,700	S	None
	Port Jerome (Le Havre)	6,500	S-C	2,300
Raffinerie de Petrole du Nord, Paris	Dunkerque	10,000	S-C	2,000
Ste. Ame des Petroles "Jupiter" (Shell), 42 Rue Washington, Paris 8	Petit Couronne (Rouen)	19,000	S-C	2,800
	Pauillac (Bordeaux)	10,000	S	None
Ste. de Raffinage des Huiles de Petrole (Anglo-Iranian, 19-21 Rue de la Bienfaisance, Paris 8e	Courchelettes,† (shut down, half destroyed)	7,000	L-W-A	2,000
	L'Avera† (Marseille)	21,000	S-C	7,600
Ste. des Raffineries de Petrole de la Gironde (Texas Co.), 7 Place Vendome, Paris	Bec d'Ambes (Bordeaux)	6,300	S-C	5,000
Standard Francaise des Petroles, 82 Champs Elysees, Paris 8	Port Jerome (Le Havre)	28,000	L-A	4,000
Total France		193,000		70,700

*Work under way at Cie. Francaise de Raffinage plants includes: Gonfreville-L'Orcher, one 20,000 bbl. daily two-stage crude distillation unit and one 16,000-bbl. daily tannin-solutizer unit; La Mede-Martigues, one 20,000-bbl. daily crude topping unit, and one 11,000-bbl. daily tannin-solutizer unit.

†Ste. de Raffinage des Huiles de Petrole (Anglo-Iranian) refineries: It was planned to commission the lubricating-oil treatment plant at Courchelettes in October 1947; crude-oil capacity of the L'Avera refinery has been increased by adaption of vacuum distillation unit for crude topping. Plans call for the construction at Dunkerque of a new refinery of 26,000-bbl. daily capacity which will replace the former Dunkerque refinery of Raffinerie de Petrole du Nord and the Courchelettes refinery. Courchelettes will specialize in the manufacture of lubricating oils from distillates obtained at Dunkerque.

GERMANY

Refinery operations in Germany are controlled by occupation countries. Several plants are operating part capacity with German crude oil estimated to total approximately 12,000 bbl. at this time. The Shell interests have plants at Monheim, Grasbrook, Harburg, Reisholz, and Wilhelmsburg. Ebano Asphalt-Werke A.G. (Standard of New Jersey) is operating a 2,500-bbl. plant at Harburg. Deutsche Vacuum Oil Co. (Socony-Vacuum Oil Co., Inc.) has a 1,500-bbl. refinery in operation at Oslebshausen. According to occupation sources there are nine refineries in Germany with a capacity of 24,000 bbl. daily.

HUNGARY

Recent information not available as to present status of several small plants.

Fanto Associated Hungarian Oil Co., Ltd., Budapest 5	Budapest	1,100	S-L	None
Hazai Koolajipar R. T., Budapest	Budapest	1,000	S-L	None
Magyar Hydrobenzin R. T., D. Nador-Utca, Budapest	Petfurdo	1,200	S-C	350
Magyar Olaj Nuvek, Budapest	Szony	1,350	S	None
Magyar Petroleum-Dr. Freund, Budapest	Csepel (Budapest)	1,100	S	None
Nyirbogdanyl Petroleumgyar R. T., Budapest	Nyirbogdany	300	S-L	None
Shell Koolaj R. T., Budapest	Csepel (Budapest)	3,500	L-A	None
Vacuum Oil Co., R.T., V., Budapest	Fuzito	3,800	L-W-A	None
Total Hungary		13,350		350

INDIA

Assam Oil Co., Ltd. (controlled and managed by Burmah Oil Co., Ltd., 175 West George St., Glasgow C. 2, Scotland)	Digboi (Lakimpur District, Assam)	5,750	Comp.	1,500

IRAN*

Anglo-Iranian Oil Co., Ltd., Britannic House, Finsbury Circus, London, E.C. 2	Abadan†	420,000	S-C-A	125,000
Kermanshah Petroleum Co. (Anglo-Iranian), Britannic House, Finsbury Circus, London, E.C. 2	Kermanshah	2,100	S	None
Total Iran		422,100		125,000

*Does not include small topping plants located in fields to supply field demands. †Catalytic cracking equipment and lubricating oil plant installed.

IRAQ

Iraq Petroleum Co., Ltd., City Gate House, Finsbury Circus, London E.C. 2	Baba Gurgur	1,500	S	None
Khanaqin Oil Co., Ltd. (Anglo-Iranian) Britannic House, Finsbury Circus, London E.C. 2	Alwand	6,900	S	None
Total Iraq		8,400		

Iraq Petroleum Co., Ltd., also operates in Kirkuk field a crude stabilization plant designed to remove H_2S. This is currently being expanded to a total capacity of 270,000 bbl. daily.

ITALY

Azienda Generale Italiana Petroli, Rome	Venice	5,800	S-C	3,100
Azienda Nazionale Idrogenazione Combustibili, Via Fatebenefratelli, N. 7, Milan	Bari	5,000	(*)	2,000
	Leghorn	4,500	(*)	2,000
Distillazione Italiana Combustibili, Soc. An., Venice	Porto Maghera (Venice)	5,600	S-C	3,500
Raffineria de Napoli S.A.I. (Socony-Vacuum), Casella Postale 269, Naples	Naples	5,500	S	None
Soc. per l'Industria Italiana del Petrolio (subsidiary "Nafta" Soc. Italiana del Petrolio ed Affini (Shell), Plaza della Vittoria, Genoa	La Spezia	6,000	S-C-A	1,500
Soc Petrolifera Italiana (Jersey Standard) Fornovo Taro	Fornovo Taro	1,000	S	None
Total Italy		33,400		12,100

*Hydrogenation plants. This process will be discontinued and production of high-grade gasoline and lubricating oil will be developed. By 1951, Italy's estimated capacity, 53,000 bbl. per day. A.N.I.C. and Standard Oil Co. of New Jersey plan to reconstruct the Leghorn refinery to increase its crude charging capacity to 1,500,000 tons annually (30,000 bbl. daily) and to add three catalytic cracking units, and to increase the capacity of the Bari refinery to 500,000 tons annually.

JAPAN

The future of Japan's refining industry is clouded by the still-unsettled peace terms and reparations demands. During the war, according to a report of the Allied Military Government, the country's refineries had a total capacity of 110,145 bbl. daily. War damage has cut this to a present capacity, not including Hokkaido, of 57,880 bbl. daily. Military Government figures show this is divided 25,500 bbl. daily southern and western Japan, 12,850 bbl. daily the Tokyo-Yokohama area, and 19,530 bbl. daily indigenous crude. However, in the case of the Pacific Coast refineries—those designed for nonindigenous imported crude—the total capacity includes some units marked for conversion to fertilizer manufacture, facilities not requiring some repair, and other exceptions. In October 1946, the Pacific Coast refineries were directed by occupation authorities to cease operations and complete processing of existing stocks by the end of November 1946. The following list of existing plants is compiled from available sources of information with present company addresses not available.

Pacific Coast Refineries

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
Daikyo Oil Co.	Yokkaichi	1,550	S-L	None
Koa Oil Co.	Marifu*	5,000	S-C-L	950
	Yokohama	500	S-L	None
Maruzen Sekiyu Oil Co.	Shimotsu	2,000	S-L	None
	Matsuyama	2,300	S	None
Nippon Oil Co., Ltd.	Kudamatsu*	2,500	S-L	None
	Yokohama*	3,500	S-C-L	1,000
Showa Oil Co.	Kainan	280	S-L	None
	Kawasaki	5,800	S-C	1,000
Toa Nenryo	Shimizu	1,400	S-L	None
Refineries Operating on Indigenous Crude				
Nippon Oil Co., Ltd.	Akita	3,600	S	None
	Hokkaido	500	S	None
	Garugawa	750	S	None
	Kashiwazaki	4,200	S-L	None
Nippon Mining Co.	Funkawa	3,020	S-L	None
Showa Oil Co.	Hirasawa	500	S-L	None
	Niigata	3,000	S-L	None
Total Japan		40,400		2,950

*Includes facilities requiring some slight repairs or in the process of repair.

MEXICO

Petroleos Mexicanos, Articulo 123, No. 116, Mexico, D.F.	Arbol Grande	22,000	L-W-A	None
	Bella Vista		C	1,100
	Ciudad Madero	60,000	Comp.	4,900
	18 de Marzo (Atzcapotzalco)	50,000	S-C	13,000
	Minatitlan	26,000	S-L	None
	Poza Rica	4,000	S	None
	Villa Cuauhtemoc	13,000	S-C-L	8,000
Total Mexico		175,000		27,000

Petroleos Mexicanos has announced award of a contract for the construction of a new complete refinery at a cost of $12,000,000 at Salamanca. This plant will consist of a 30,000-bbl. distillation unit and gas-oil thermal cracking. Plans call for the dismantling of the Bella Vista and Villa Cuauhtemoc refineries at Tampico and using salvageable equipment at Salamanca.

NETHERLANDS

N. V. de Bataafsche Petroleum Mij. (Shell), Carl van Bijlantlaan 30, The Hague	Pernis (Rotterdam)	14,000	S-A-C	16,500

Caltex Petroleum Mij. (Netherlands) N. V., a subsidiary of California Texas Oil Co., Ltd., is preparing to begin construction of a 20,000-bbl. capacity refinery on the Rhine River about 4 miles from Rotterdam. The plant will cost about $18,000,000.

NETHERLANDS WEST INDIES

Aruba

Lago Oil & Transport Co., Ltd., San Nicolas, N.W.I.	Aruba	360,000	S-C-A	200,000
Arend Petroleum Mij., Willemstad, Orarjestad, Aruba	Druif, Aruba	20,000	S-C	3,000
Total Aruba		380,000		203,000

Curacao

Curacaosche Petroleum Industrie Mij., Carl van Bijlandtlaan 30, The Hague	Emmastad	200,000	S-C-L-A	100,000
Total Netherlands West Indies		580,000		303,000

PALESTINE

Consolidated Refineries, Ltd., Britannic House, Finsbury Circus, London, E.C. 2	Haifa*	63,000	S-C-A	33,000

*Additional crude distillation equipment to increase capacity to 84,000 bbl. daily planned, also lubricating-oil plant.

PAKISTAN

Attock Oil Co., Ltd., 24/28 Lombard St., London, E.C. 3	Rawalpindi, West Punjab	4,800	Comp.	2,000

PERU

Cia. de Petroleo Ganso Azul., Ltd., Edificio San Martin, Union 892, Lima	Agua Caliente Concession, Rio Pachitea	1,000	S	None
Establecimiento Industrial de Zorritos (Peruvian Government), Apartado 130, Calle Constitution 25, Callao	Zorritos	1,000	S	None
International Petroleum Co., Ltd., Talara	Talara	28,000	S-C-L-A	6,600
Total Peru		30,000		6,600

PORTUGAL

Soc. An. Concessionaria da Refinacao de Petroleos em Portugal, P.O. Box 539, Lisbon	Cabo Ruivo Lisbon	700	S	None

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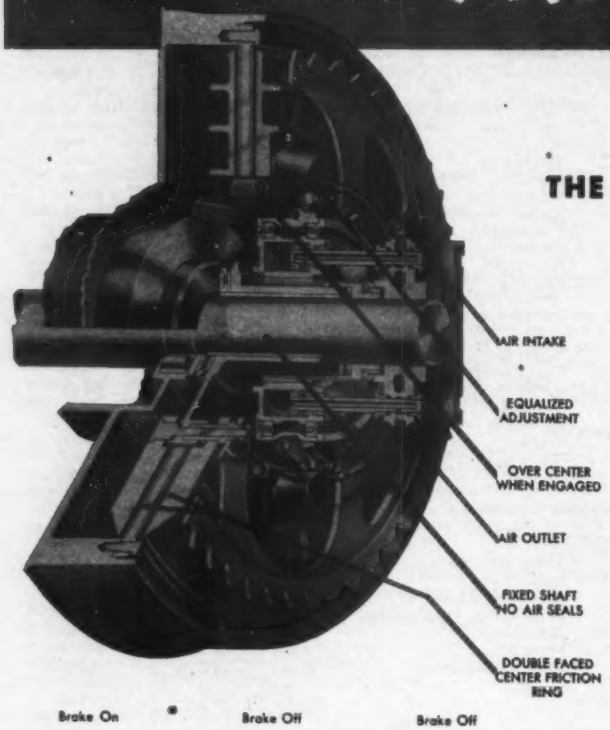

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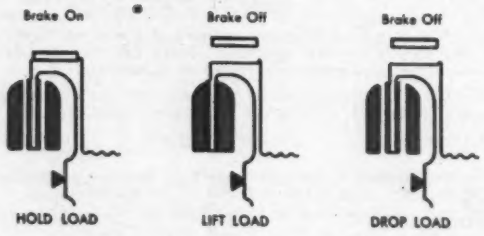

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POLAND

Nationalization of Polish industry was decreed by the Polish Parliament January 3, 1946, and government officials are operating the petroleum industry for the account of the state. Present organization consists of a Central Management of the Liquid Fuel Industry under the minister of industry. Operating branch for refining and producing is United Petroleum and Natural Gas Industries. Poland's refining industry, rated at 23,000 bbl. daily before the war, was badly damaged, and little information is available on its present exact status. The following is a list of plants compiled from available sources:

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cracking capacity (bbl. dly.)
(Formerly Vacuum Oil Co.)	Czechowice	1,250	S-A-W-L	None
[Formerly owned by the "Malopolska" group (French)]	Glinik Mariampolski	1,250	S-W	None
	Jedlicze	850	S-L	None
	Trezebinia	2,500	S-L	None
	Jaslo (reconstructed)	1,000	S-L	None
[Formerly owned by the Fink group (Polish)]	Ligota	250	S-L	None
Total Poland		7,100		

ROMANIA

Complete data on the Romanian refining industry is not available. The following list of plants is from company and other sources. Several of the plants are either shut down or operating part capacity.

Astra Romana, S.A. (Shell), No. 32, Boulevard Regele Carol 1, Bucharest	Ploesti-Sud	38,000	Comp.	12,000
Colombia Soc. Franco-Rumanine de Petrol, 10 Rue Romania, Bucharest	Ploesti-Sud	10,000	S-C	5,000
Concordia Soc. An. Rumaine pour l'Industrie due Petrole, Strada Matei Millo, 15, Bucharest	Ploesti-Nord	29,000	S-C	4,200
Creditul Miniere, Soc. An Rumaine pour le Developpement de l'Industrie Miniere, Boulevard Bratianu 16, Bucharest	Brazi-Prahova	11,000	Comp.	3,500
Dacia Romano Petroleum Synd., Ltd., 83 Cannon St., E.C. 2, London; Cantacuzino 33, Bucharest	Ploesti-Nord	5,000	S	None
Neo Petrole (Fratia)	Ploesti-Sud	3,000	S	None
"Petrol Block" S.A.R., Strada Nicolae Golescu, 7, Bucharest	Ploesti	8,500	S-C	4,000
Petrol Latina S.A.R., Bucharest	Ploesti	3,000	S	None
"Photogen" Rafineria de Petrol, S.A. (Socony-Vacuum) Str. Juli Maniu 104-108, Brasov	Ploesti-Nord	3,500	S	None
Romano-Americana, S.A., 126 Calea Victorei, Bucharest	Teleajen	20,000	S-C-L-A	8,000
"Romano-Belgiana Depetrol" S.A. Strada Biserica Amzel 28, Bucharest	Ploesti	5,000	S	None
Spies Petroleum Co., Ltd., 17 Waterloo Place, S.W. 1, London	Campina	31,000	Comp.	6,300
Steaua Romana S.A., pour l'Industrie du Petrole, Boulevard Carol 17, Bucharest	Moinesti	2,000	S	None
"Unirea" S.A.R. de Petrol (Phoenix Oil & Transport Co., Ltd., London), Casuta Postala 1, Ploesti	Ploesti	7,000	S-C	
		14,000	S-C	7,000
		3,500	L-A	
Total Romania		193,500		50,000

SPAIN

Compania Arrendataria Monoplio de Petroleos S.A. Torija 9, Spain	Cornella-Barcelona	700	L-A	None

SAUDI ARABIA

Arabian American Oil Co., Dhahran, Saudi Arabia	Ras Tanura	115,000	S-C	14,000

SWEDEN

A. Johnson & Co., Stockholm	Nynashamn	3,500	S-C	2,700
Stora Copeberg Co., Transatlantique	Goterborg	1,500		
Total Sweden		5,000		2,700

TRIESTE

"Aquila" S.A. Tecnico-Industriale, Trieste	Trieste*	10,000	S-L	None
Standard Soc. Italo Americana del Petrolio (Jersey Standard), 40 Via Assarotti, Genoa, Italy	Trieste	2,000	S-L-A	None
Total Trieste		12,000		

*Expansion to 12,000 bbl. daily in 1948 planned.

TRINIDAD

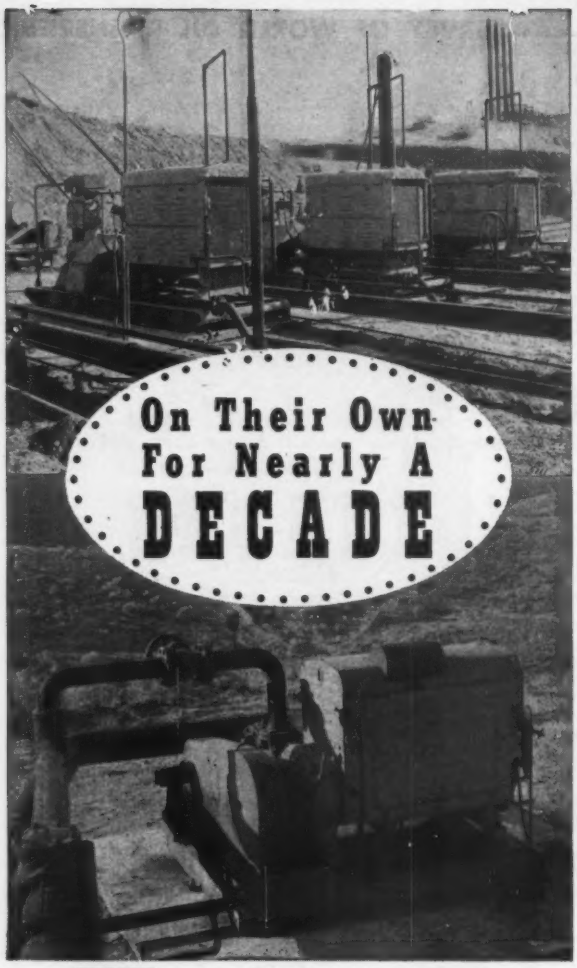
Kern Trinidad Oilfields, Ltd., 36-38 Kingsway, London, W.C. 2	Guapo	1,000	S	None
Trinidad Lake Asphalt Operating Co., Ltd. (General Asphalt subsidiary), Barber, N. J.; Philadelphia	Brighton	1,000	A	None
Trinidad Leaseholds, Ltd., Salisbury House, Finsbury Circus, London E.C. 2	Pointe-a-Pierre	*65,000	S-C	*50,000
Trinidad Oilfields Operating Co., Ltd., Port-of-Spain	La Brea	1,300	S	None
United British Oilfields of Trinidad, Ltd., St. Helen's Court, Great St. Helen's, London E.C. 3, England	Point Fortin†	28,000	S-A	None
Total Trinidad		96,300		50,000

*A total of 10,000 bbl. crude capacity and 10,000 bbl. reforming capacity is now shut down. †High-vacuum asphalt plant now under construction. Second plant, consisting of continuous-blowing asphalt equipment, planned.

UNITED KINGDOM

England

Agwi Petroleum Corp., Ltd. (Jersey Standard), Brettenham House, Lancaster Place, London, W.C. 2	Fawley*	15,000	S-C-A	8,000
Berry, Wiggins & Co., Ltd., 86 Strand, London, W.C. 2	Kingsnorth Kent	2,500	S-L	None
	Weaste North Manchester	1,500	S	None
Cory Brothers & Co., Ltd., 57/59 Street, Mary Axe, London, E.C. 3	Coryton, Port of London	5,000	S-C-A	2,000



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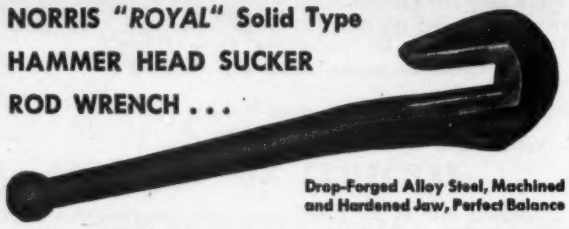

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UNITED KINGDOM

England (Continued)

Company and address—	Plant location	Crude capacity (bbl. dly.)	Type of refinery	Cr… capacity (bbl. dly.)
Lobitos Oilfields, Ltd., 146 Dashwood House, Old Broad Street, London, E.C. 2	Ellsmere Port	4,000	Comp.	1,000
London & Thames Haven Oil Wharves, Ltd., 3 St. Helen's Place, London, E.C. 2	Thames Haven	10,000	S-L	None
London & Coastal Oil Wharves, Ltd., 3 St. Helen's Place, London, E.C. 2	Canvey Island	1,500	S	None
Major & Co., London	Hull	1,250	S-L	None
Manchester Oil Refinery, Ltd., Twining Road, Trafford Park, Manchester 17	Trafford Park†	2,800	S-L-W	None
Shell Refining & Marketing Co., Ltd., Norman House, Strand, London, W.C. 2	Shell Haven‡	13,000	S-L-W-A	None
	Stanlow‡	13,000	L-A	None
Total England		69,550		11,000
Scotland				
Shell Refining & Marketing Co., Ltd., Norman House, Strand, London, W.C. 2	Ardrossan	3,500	S-A-L	None
Scottish Oils, Ltd. (Anglo-Iranian), 53 Bothwell Street, Glasgow, E.C. 2	Grangemouth	7,500	S-C	3,000
William Briggs & Sons, Ltd., Dundee	Dundee	1,000	L-A	None
Total Scotland		12,000		3,000
Wales				
National Oil Refineries, Ltd. (Anglo-Iranian), Britannic House, Finsbury Circus, London, E.C. 2	Llandarcy	11,000	Comp.	4,000
Total United Kingdom		92,550		18,000

*Standard Oil Co. (N. J.) has announced plans to spend approximately $140,000,000 to increase the capacity of this refinery to 120,000 bbl. daily by 1952. †Expansion of plant for the production of petroleum-derived surface-active agents completed. Expansion of blending and filling department and additional administrative buildings planned. ‡The Shell organization has begun construction of a petrochemical plant on an 85-acre site at Thornton-le-Moors; plant to have capacity of 24,000 tons a year of various products of petroleum origin. Existing plants associated with this new equipment are the Shell Haven and Stanlow refineries. The Stanlow plant is producing some 24,000 tons a year of chemical products; expansion to 50,000 tons a year planned. Expansion at Shell Haven will increase the petrochemical capacity to about 30,000 tons a year.

U.S.S.R.

No official information is available on the present capacity of Russia's refineries. Prewar the U.S.S.R. had 13 refineries with a crude capacity of 637,500 bbl. daily and a cracking capacity of 178,500 bbl. daily. Part of this was destroyed, and present capacity is estimated at 575,000 bbl. daily.

UNITED STATES

For data on refineries of the United States, see compilation published in The Oil and Gas Journal's Refining Number, March 22, 1947. Total United States refineries, 365, crude capacity 5,399,280 bbl. daily, cracking capacity 3,388,460 bbl. daily. 1948 Survey will be published April 1, 1948.

URUGUAY

Administration Nacional de Combustibles, Alcohol y Portland, 25 de Mayo 409 (P.O. Box 869), Montevideo	Montevideo*	6,300	S-C	2,000

*This refinery to be expanded to 13,000-bbl. daily capacity.

VENEZUELA

British Controlled Oilfields, Ltd., San F. a Pajaritos No. 15, Caracas	Mene Mauroa	250	S	None
Caribbean Petroleum Co. (Shell), Mijares a Mercedes 25, Caracas	San Lorenzo	38,000	S	None
Colon Development Co., Ltd. (Shell), Mijares a Mercedes 25, Caracas	Casigua	700	S	None
	La Rivera	200	S	None
	El Cavario	200	S	None
Creole Petroleum Corp., Apartado 889, Caracas	Caripito	54,000	S-C	24,000
	La Salina	10,000	S-A	None
Mene Grande Oil Co., Apartado 234, Maracaibo	Cabimas	1,800	S	None
	Oficina	830	S	None
Socony-Vacuum Oil Co., Mer Salas a Caja de Agua 59, Caracas	Guario	120	S	None
Texas Petroleum Co., Tienda Honda a Punte 59, Caracas	Tucupita	10,000	S	None
Total Venezuela		116,100		24,000

Note.—Two new refineries are now under construction on Paraguana Peninsula in northwestern Venezuela. One is being built by Royal Dutch-Shell interests at Punta Cardon. Its capacity will be 60,000 bbl. daily with an equal capacity in cracking facilities slated. The second is being built by Creole Petroleum Corp. at Amuay Bay. Capacity of this refinery will be about 60,000 bbl. daily. In addition to these projects, Mene Grande Oil Co. and Sinclair Oil Corp. are reported planning to construct refineries of 20,000 and 35,000 bbl. daily capacity respectively at Puerto La Cruz.

YUGOSLAVIA

Little official information obtainable on the Yugoslavia refining industry. The following data are compiled from available sources:

Ivanovic & Co., Belgrade	Osijek	550	S	None
Raffineria di Olii Minerili (A.G.I.P.), Fiume	Fiume	2,500	S-L-W	None
Shell Oil Co. of Jugoslavia, Ltd., Zagreb	Sisak (Caprag)	2,000	S	None
Standard-Vacuum Oil Co. of Yugoslavia, Inc., Zagreb	Brod	2,250		None
Sumadiska Kreditava, Belgrade	Smedereve	1,000	S	None
Total Yugoslavia		8,300		

Refining Expansion 4,000,000 Barrels OUTSIDE U.S. TO REACH BY 1951

by Dahl M. Duff

APPROXIMATELY 900,000 bbl. refining capacity will be added in areas outside the United States with the completion of all construction and rehabilitation work, including both that definitely scheduled and projects still in the discussion stage.

This foreign refinery-expansion program extending over the next 3 years will increase total crude throughput capacity, now placed at slightly more than 3,000,000 bbl. daily, by about a third.

A survey of refinery construction outside the United States shows approximately 600,000 bbl. daily additional capacity is promised by projects which have been definitely made public, in most cases by the companies themselves.

Another 300,000 bbl. daily throughput capacity is indicated by expansion programs of a less definite nature. Some of these involve long-range company planning or objectives on the part of governments. Examples are the additional 30,000-35,000-bbl. daily capacity sought by Argentina under its 5-year plan, and the plans of Chinese Petroleum Corp. to rehabilitate the 2,500-bbl. daily Japanese refinery on Formosa.

With all contemplated new construction, refining capacity outside the United States will reach a total of some 4,000,000 bbl. daily in 1951. This processing capacity will be utilized to satisfy a foreign demand which most petroleum economists believe will be between 3,500,000 and 4,000,000 bbl. daily by that time.

Foreign refineries were estimated to have a total throughput capacity of 2,870,000 bbl. daily in 1939. Destruction during the war has been offset by new construction in the Western Hemisphere and the Middle East and by rehabilitation work in the first 2 postwar years. In 1946 total foreign refining capacity was not fully utilized, and runs to stills early in 1947 are estimated at about 2,300,000 bbl. daily—some 700,000 bbl. daily below what appears to have been possible had adequate and suitable crude supplies, transportation facilities, and other equipment been available.

Aerial view of Abadan refinery area, showing Bawarda jetties, with new Bund line in foreground

Reconstruction of war-damaged refineries alone would have been a tremendous task for the world petroleum industry. Above this, however, is the necessity of expansion in view of the definite shift to the use of liquid fuels. This trend is particularly pronounced in Europe where preparations are being made to refine particularly Middle East oil not only for its light fractions but also for fuel oil as a power source replacing coal. Though Europe is the most important oil-consuming area outside the United States, indications point to an increasing per capita consumption elsewhere throughout the world.

Evident in a summary of refinery construction plans is the determination of various national governments to build up domestic refining industries. Some producing countries are seeking maximum processing of indigenous crude in the country itself. On the other hand, various important consuming countries are encouraging

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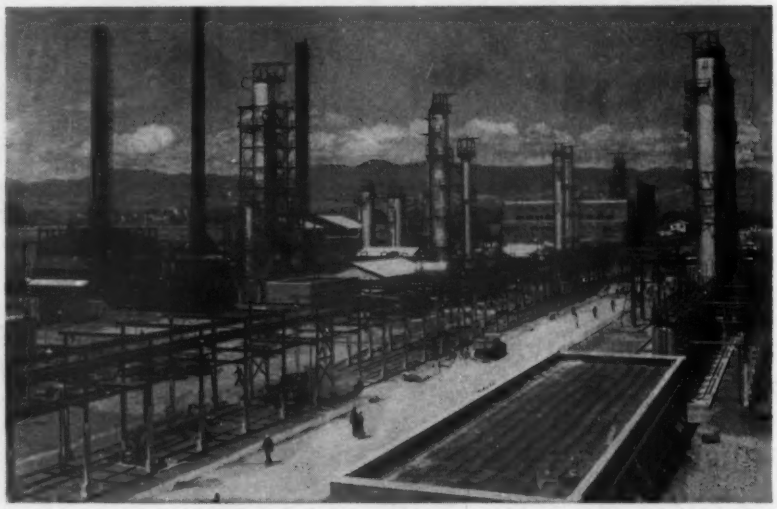
Refinery of Administracion Nacional de Combustibles, Alcohol y Portland (ANCAP), at Montevideo, Uruguay

refineries which will allow importation of crude oil rather than finished products.

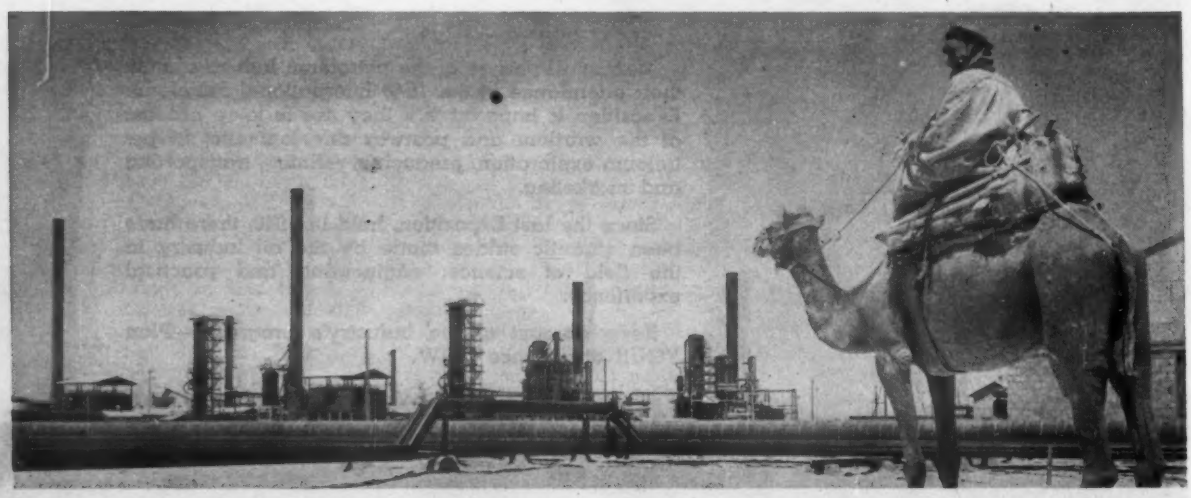
Considering solely the reasonably definite construction projects totaling about 600,000 bbl. daily in new capacity as shown in the accompanying table, the list shows 17 completely new refineries scheduled to be built. This compilation excludes Russia and some Eastern European countries where reliable information is not available.

The tabulation includes 46 projects, among them several chemical plants and asphalt refineries. In many cases, additional throughput will result from improvement of existing equipment. Largest single project from the standpoint of capacity is the 120,000-bbl. daily refinery which the Standard Oil Co. (N.J.) organization is planning to construct at Fawley, England.

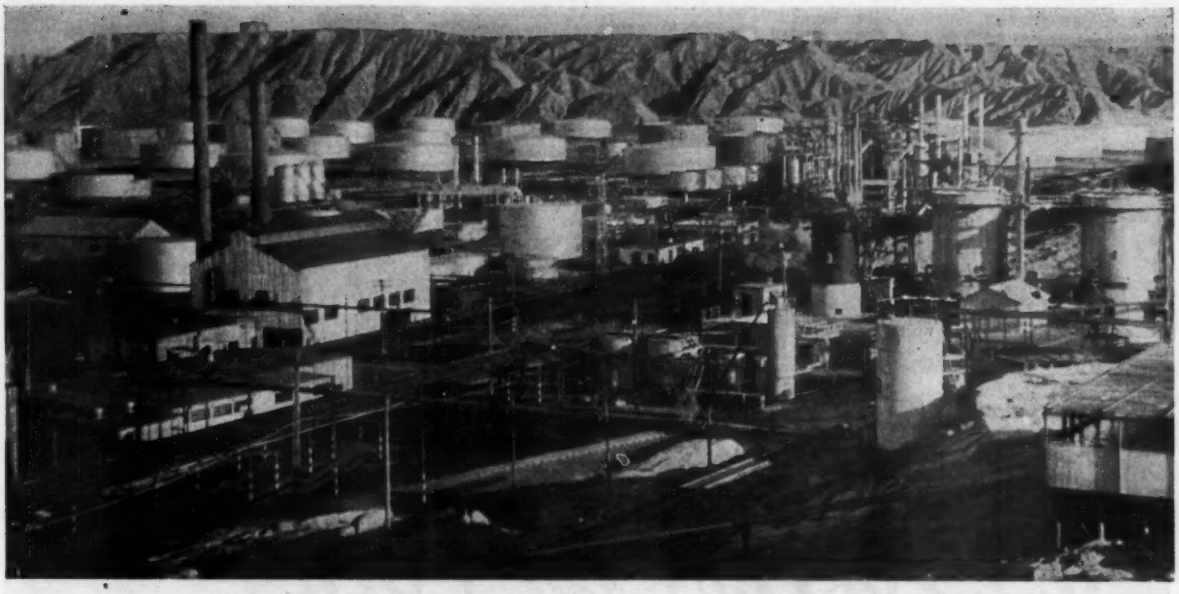
The tabulation reflects some, but



General view of refinery of Petroleos Mexicanos, at Mexico City



Desert camel and Arab pictured beside Arabian American Oil Co.'s Ras Tanura refinery on the Persian Gulf Coast of Saudi Arabia



View of International Petroleum Co., Inc., refinery at Talara, principal oil town of Peru

not all of the relatively minor modernization and improvement projects under way and planned at many refineries. Much of the equipment in some foreign refineries is known to be antiquated and in need of repair. The war prevented or retarded normal progress along these lines, and numerous foreign plants lack some of the facilities which are considered standard equipment in most refineries in the United States.

In North America, Canada and Mexico are the major countries of importance outside the United States. Canada, with its 7-bbl.-per-capita consumption second only to the United States, has a refining capacity of slightly more than 250,000 bbl. daily in 31 plants. Indigenous crude furnishes only a fraction of demand.

To take advantage of production from the new Leduc field, Imperial Oil, Ltd., is now moving the war-built, former U.S. Government refinery from Whitehorse, Yukon Territory, to East Edmonton, Alta. The plant, which Imperial purchased for $1,000,000 and is moving and reerecting at an additional cost of $6,000,000 to $7,000,000, probably will be in operation late next year, running 6,500 bbl. daily initially.

Early next year Imperial is expected to complete an expansion program at its Montreal East, Que., refinery which will increase capacity from 25,000 to 33,000 bbl. daily. This program includes several new process units.

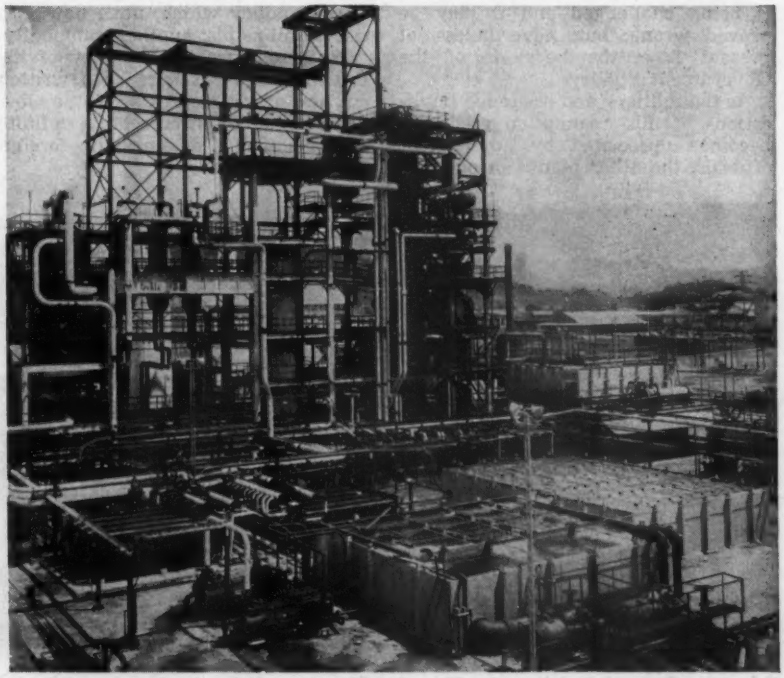
Another Canadian company now engaged in refinery expansion is British American Oil Co., Ltd., which has announced plans to enlarge its Montreal East plant from 15,000 to 35,000 bbl. daily at a cost of $15,000,000. Included is a new Fluid catalytic cracking unit. British American also is planning to spend $1,500,000 enlarging the Clarkson, Ont., plant. The company recently completed a new lubricating-oil compounding and blending plant at Clarkson, and additions and improvements to asphalt units at Moose Jaw, Sask., and Calgary, Alta.

Mexico, where the petroleum industry is in the hands of the government agency, Petroleos Mexicanos, is currently engaged in a general industrialization program requiring greater internal consumption of petroleum products and improved distribution.

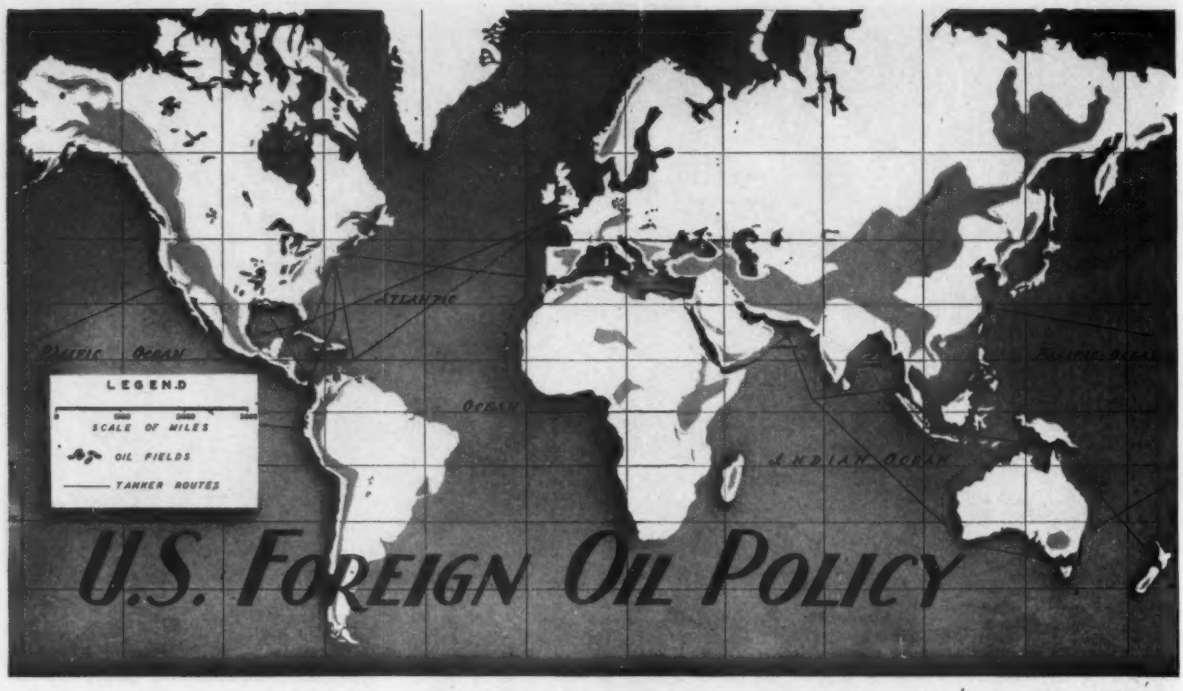
Major refining project of Pemex is the construction of a new 30,000-bbl.-daily refinery at Salamanca in the interior at a cost of $12,000,000. The project has been contracted, and work is to start in 1948. Thermal cracking is planned.

A 250-mile pipe line from Poza Rica, Mexico's principal producing field, will extend to the new refinery. Much of the Mexican refining

(Continued on page 242)



Creole Petroleum Corp. refinery at Caripito, Eastern Venezuela



—has clarified since the war and now encourages American activity abroad

by Henry D. Ralph

SOMETHING new has been added to the foreign petroleum policy of the United States as a result of the war and postwar conditions.

This is the assumption that this country will be a net importer of petroleum, perhaps on a large scale, in the not-distant future.

The correctness of this assumption is being challenged and it may be proved wrong, but, nevertheless, at present it is the keystone of the Government's policy.

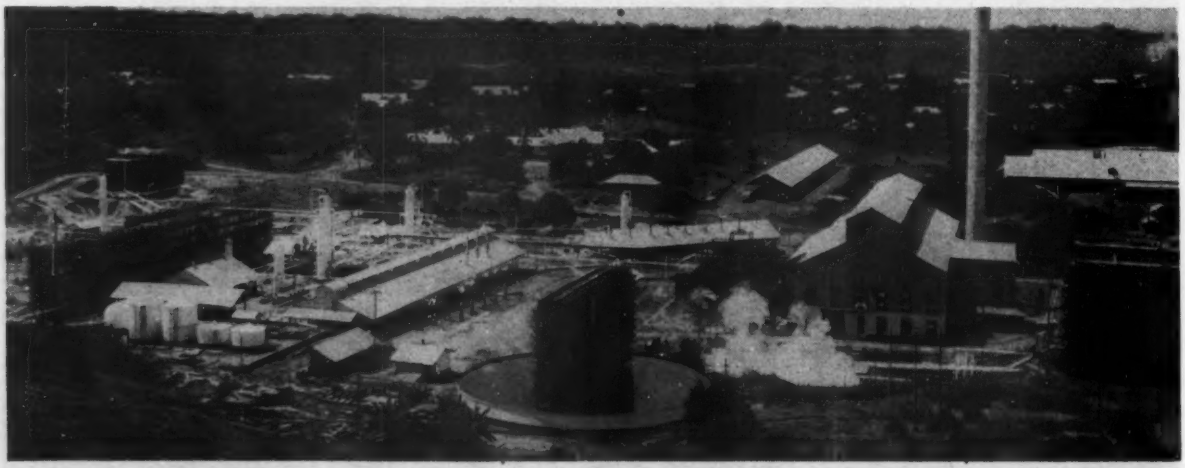
As the military and economic implications of this assumption gradually become appreciated by government officials, the other planks of our foreign petroleum policy are firming up and becoming more definite.

These other planks are not new, but they have taken on a new significance in the light of present world political and world petroleum conditions. They have been a part of our general commercial policy which, until now, has treated oil as just another commodity.

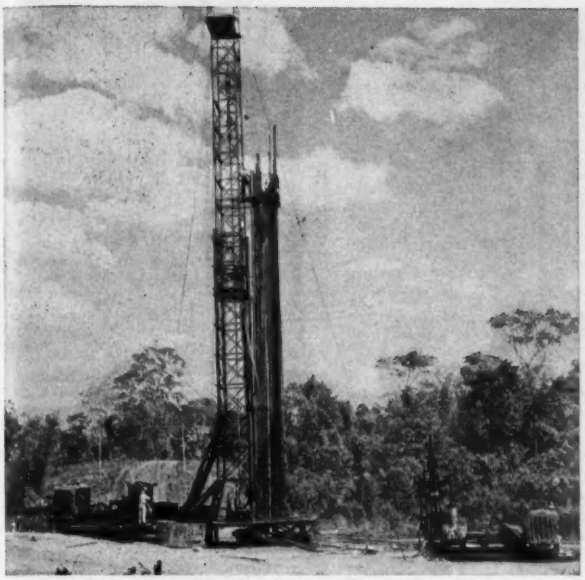
While no foreign oil policy of the United States has ever been written out and proclaimed as such, the Government has followed a quite definite line of action in dealing with foreign petroleum matters.

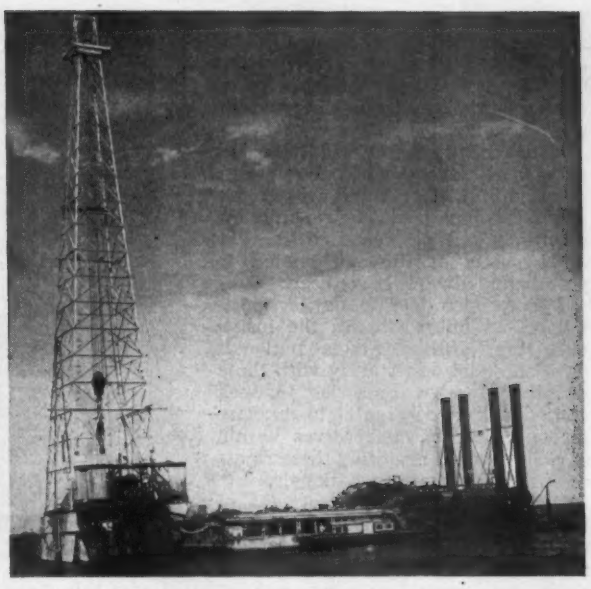
The general outlines of our policy are clear, though some of the details may be a bit hazy. It has been followed fairly consistently, though with some significant deflections. It is a permanent and long-range policy, though subject to some modification and growth.

Delineation of the United States' foreign oil policy is particularly important at this time when there is a world shortage of petroleum products, great expansion of foreign operations, unsettled political and economic conditions throughout the world, fear on

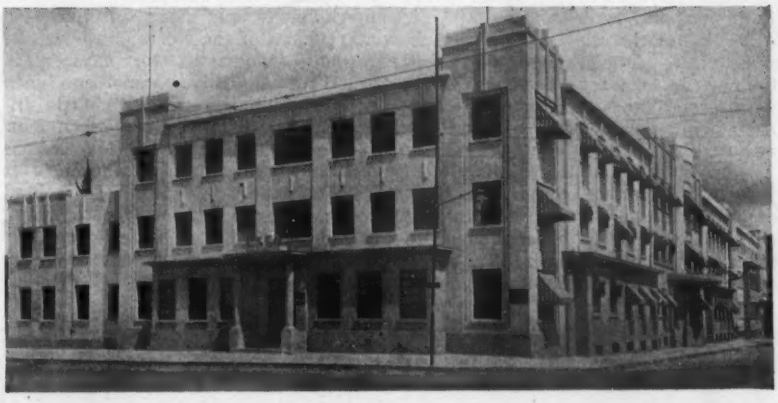


Colombia.—Centered in Infantas-La Cira oil fields are producing headquarters of Tropical Oil Co. at El Centro. Power plant is at right. At left is central gasoline plant (there are a total of five) and stabilizers. Company offices, warehouses, shops, and homes in background





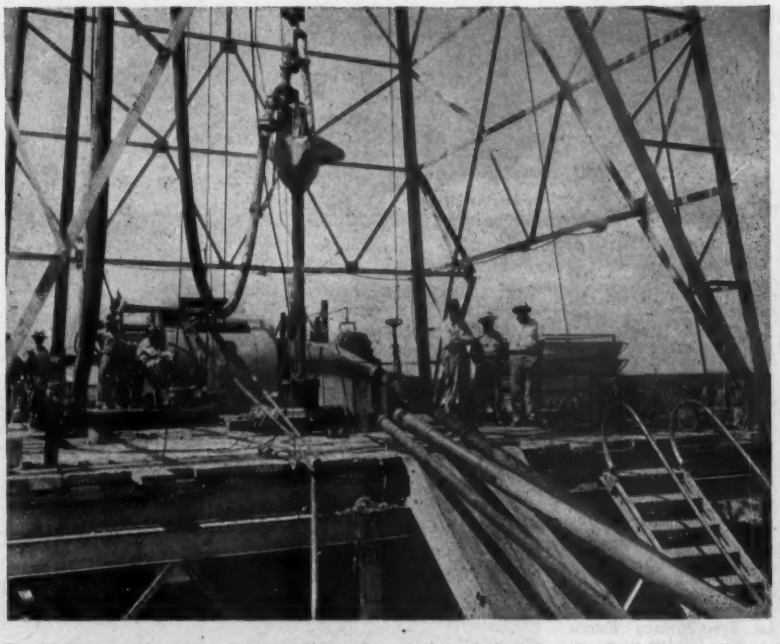
Above, left: Eastern Venezuela.—Portable rotary rig cleans out a well in Quiriquire field. A "twin" producing well is located behind the power-driven slush pump. Above, right: Western Venezuela.—The derrick is on caissons, boilers and mud tanks on barge —in this Tia Juana field drilling well in Lake Maracaibo. Right: View of Creole Petroleum Corp.'s headquarters building at Caracas



the part of some nations that the United States is imperialistic, and fear on the part of domestic producers that their interests are being ignored At the same time, attempts are being made in various quarters to twist, misrepresent, or alter the policy.

It is often suggested that our foreign oil policy should be spelled out in so many words and adopted officially, perhaps by Congress. Since this has not been done, the policy is set by, and can be learned from, speeches and statements of State Department and other government officials, various government documents, analyses by independent students of the subject, and—most important of all—the actions of the U. S. Government.

The nearest approach to a formal statement of our oil policy is the Anglo-American petroleum treaty, not yet ratified by the Senate. It does not include all details of the policy but it does embody the basic principles in general terms. Volumes have been written in an attempt to interpret this treaty, but most of the discussion has been the hopes or fears of various individuals that the document's language might be so twisted as to support some new and different policy in the future. Most of the treaty's endorsers insist it is simply the embodiment of what our policy has always been and that its importance lies in this fact. They argue that the



Eastern Venezuela.—One of Compania de Consolidada de Petroleo (Sinclair) "big rigs" on a wildcat operation near Santa Barbara field

treaty is not necessary in so far as relations between the United States and Great Britain are concerned but that if other nations subscribe to it our foreign oil policy will become the world's policy.

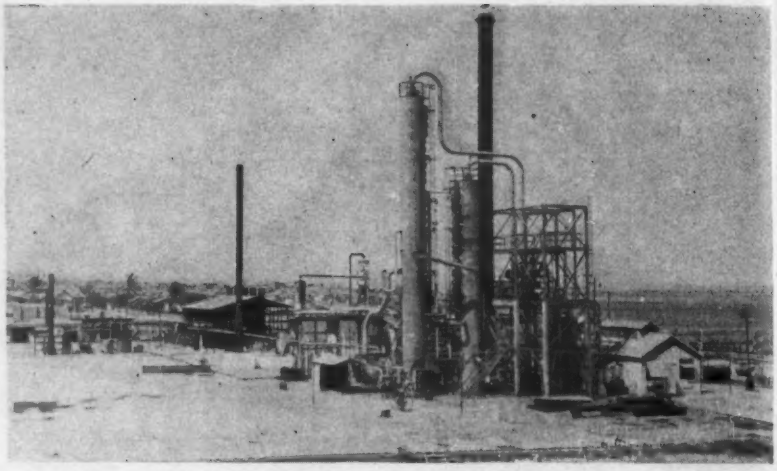
Until recently the United States has had no special oil policy, for foreign petroleum matters came within our general commercial policy affecting all trade and all commodities. The chief points of this, as related to petroleum, always have been:

1. The "open door" policy, or most-favored-nation treatment; the insistence that United States nationals have an equal opportunity with those of other foreign countries to seek concessions and grants to explore for and develop oil reserves within any country not reserving these rights exclusively to its own nationals.

2. Nondiscriminatory treatment of United States companies, as compared with nationals and other foreign firms, in production, refining, and marketing operations, and nondiscrimination against American goods in import and tariff policies.

3. Diplomatic assistance, when requested, to American companies in their various dealings, large and small, with foreign governments; such assistance being more or less of a routine nature.

4. Insistence on the principle of just and adequate compensation in cases where a foreign government chooses to cancel a concession or to expropriate or nationalize the properties of an American company.

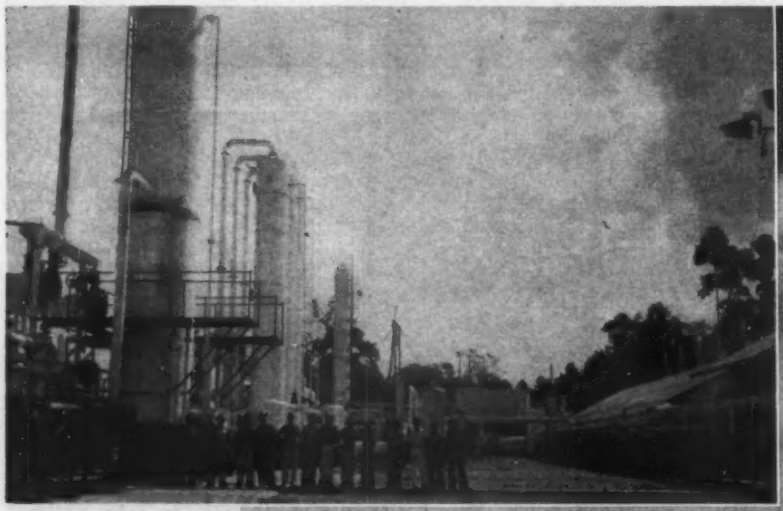


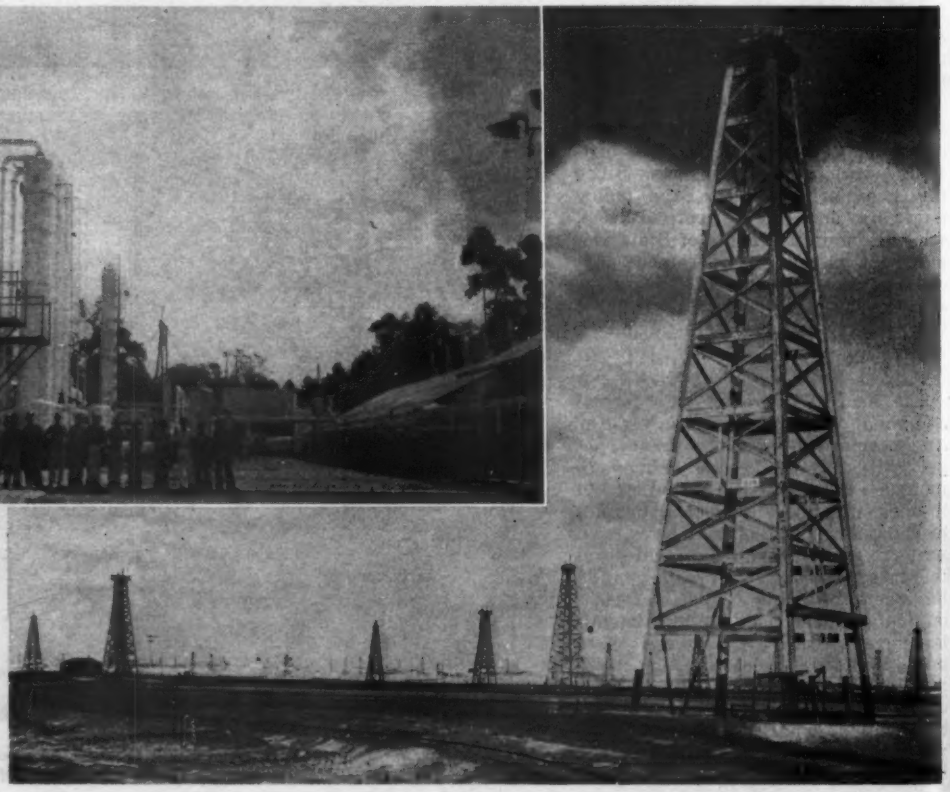
Ecuador.—Refinery of Anglo-Ecuadorian Oilfields, Ltd. Location is only 5 miles from the oil fields on the Santa Elena peninsula; the Pacific Ocean can be seen in the right-hand border of the photo

Under this general commercial policy American oil companies developed markets for petroleum products in many parts of the world and obtained foreign concessions for exploration and production, in competition with other nationals, and with little interest on the part of the Government. It is significant that the Government has shown an interest in foreign oil developments only after wars and when domestic supplies were pinched, a fact which should belie charges that the United States has an imperialistic petroleum policy.

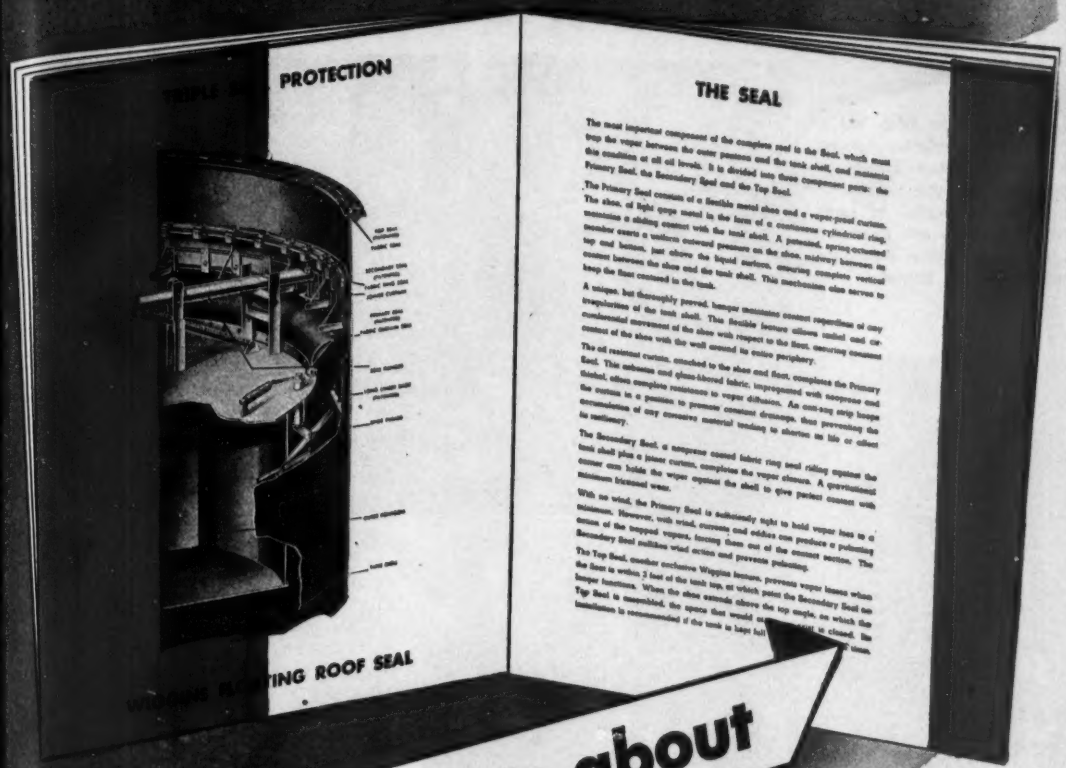
The first real concern of this Government with our foreign oil operations came right after World War I, which demonstrated the military, strategic, and commercial importance of petroleum and its significance to "have not" nations. At that time our domestic reserves were being drawn on heavily, discoveries were at a low point, gasoline consumption obviously was heading for a rise, and the price of crude went to unheard-of heights. Oil-shortage talk was rampant.

So when the Allies began dividing the spoils of victory the United States





Above: Colombian workers at this Infantas gasoline plant of Tropical Oil line up between the absorbers and compressor house. Right: Peru.—View of some of the 2,400-odd wells on the La Brea-Parinas Estate of International Petroleum Corp.



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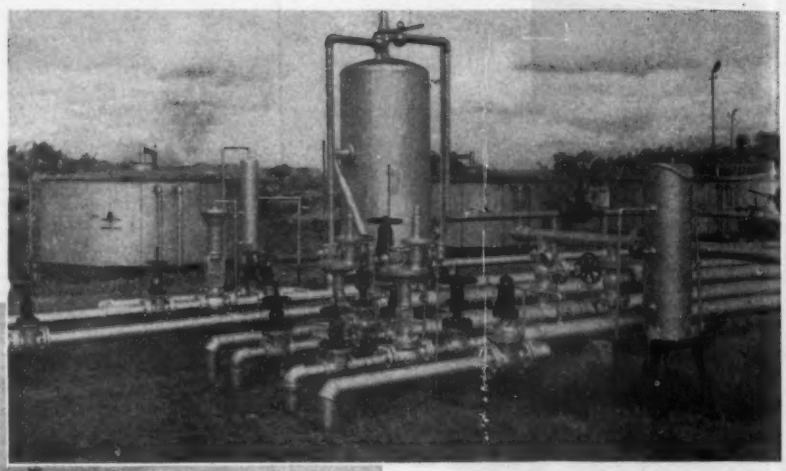
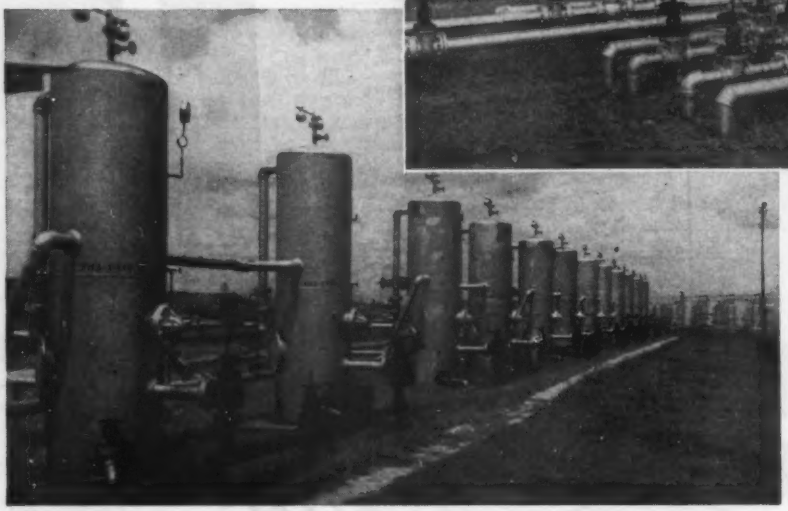




Mexico.—Right: Gas from Poza Rica field is stepped down through regulator stations manifolded like this one. Below: Battery of separators handling oil and gas production from Poza Rica's flowing wells. In right background, more separators are lined up at right angles, and behind them is shown a portion of some of the tank batteries

demanded that we get a share of the oil concessions of the former Ottoman Empire which the British and French had earmarked for themselves. After long negotiations and a firm and aggressive stand by our State Department, the way was opened, in 1923, for American oil companies to share in the reorganized Iraq Petroleum Co. Shortly thereafter the Government again intervened successfully to secure for American companies the right to exploratory and development concessions in the Netherlands East Indies.

Then the great East Texas and other huge new fields were discovered in the United States, the price of crude fell, the oil-shortage scare was forgotten, the American public lost interest in foreign affairs. American oil companies went their own ways in developing foreign production and markets, with only routine assistance from the State Department.

This was the situation in the early 1930's, when the world was swept with the twin tides of depression and nationalism.

That was the period when the New Deal administration in Washington was promoting its "Good Neighbor" foreign policy in an attempt to offset the fears of South American nations that the "Colossus of the North" was bent on imperialism. Instead of getting strong support from the State Department for their foreign operations, American oil companies got the reverse. Under a misinterpretation—or perversion—of the Good Neighbor policy by all concerned, the governments of Mexico and Bolivia expropriated and nationalized the properties of American oil companies within their borders, and the U. S. Government stood on the sidelines. Belatedly the State Department did intervene to insist, with what the oil companies considered a tongue-in-cheek attitude, that the foreign governments make "just and prompt" compensation.

Settlements Reached Eventually

Settlements were reached eventually, but the expropriated companies felt that their government had let them down and that they got the dirty end of the stick. It is significant that the British Government took a much firmer attitude toward Mexico and obtained better settlements for expropriated English oil holdings there.

Despite this lackadaisical, or negative, foreign oil policy of the State Department during the 1930's, American oil companies managed to expand their foreign activities, notably in the Middle East where the important concessions in Bahrein and Saudi Arabia were obtained and proved.

Then came World War II, which was truly an oil war. With the enemy overrunning or threatening every petroleum source outside of the Western Hemisphere, with oil products rationed in the United States, and with Allied military requirements climbing to fantastic heights, the Government again became interested in foreign oil—and in a big way.

This interest exploded in 1944 with the announcement by Harold L. Ickes, Secretary of the Interior and Petroleum Administrator for War, that the Government would buy into American oil companies operating on the Persian Gulf and would finance a pipe line across the Arabian Peninsula. The deal was to be swung through Petroleum Reserves Corp., a mysterious war-chartered government corporation headed by Ickes.

This was a brand-new foreign oil policy, and it raised a tremendous outcry from both the oil industry and politicians. Though patterned somewhat on England's aggressive and successful oil policy, it was too stiff medicine for most Americans. There were congressional investigations, resolutions by oil-industry groups, and expositions by independent students.

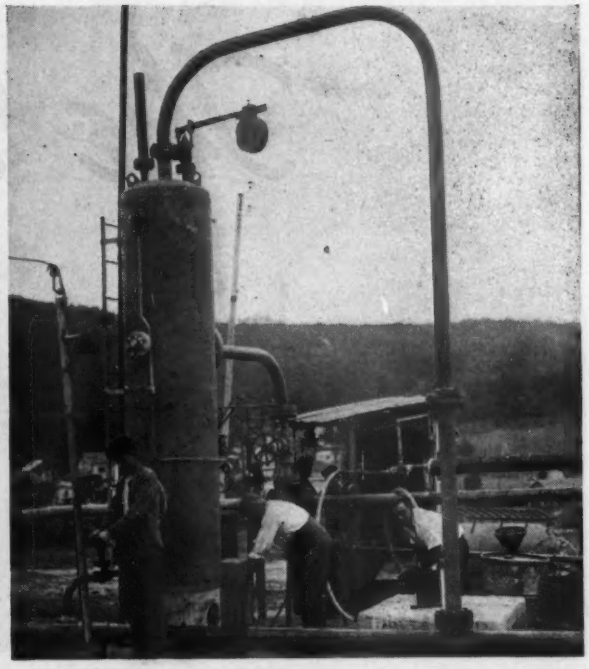
During this period the Anglo-American petroleum treaty was negotiated and it, too, met with tremendous opposition because of the implications which could be read into its loose language. The treaty was withdrawn, redrafted, and resubmitted to the Senate, where the hearings brought forth still more searching scrutiny of petroleum policy.

The treaty, with amendments and reservations, is now before the Senate for ratification. The "government partnership" idea was abandoned. Petroleum Reserves Corp. was dissolved.

But out of the controversy and the warborn concern for adequate petroleum supplies there developed a serious study of our foreign oil policy. Reams have been written on the subject during the last 3 or 4 years. Much of the discussion is what some individual or group thought our policy ought to be or ought not to be, but this interplay of ideas led to a jelling of thought.

As a result, the foreign oil policy of the U. S. Government is more definite and more positive today than

Egypt.—Ras Gharib field, typical pumping well on shore of Gulf of Suez



Iran.—Gach Saran field. This is a large-capacity horizontal separator which forms the first unit on a multistage separating system in the crude-oil stabilization unit

at any time since the Drake well was brought in.

This analysis has divided our policy, more or less arbitrarily, into nine general features. Perhaps they are not sufficiently definite or separated to be called planks, but each point seems to be a basic tenet of the Government's collective thought and action at present. To state them succinctly is oversimplification. Each requires conditions and explanations.

1. The Government assumes that the United States will be a net importer of crude or petroleum products, perhaps on a large scale, during the next few years and perhaps for the indefinite future.

This is a radical departure in our thinking, since for two generations America was a large exporter and most foreign developments were undertaken to supply foreign markets.

It is an assumption which is violently challenged by domestic producers, who insist that they can discover and produce within our boundaries all the oil which will ever be needed. They fear that the implication of this assumption will lead to domestic policies which will hamper them in their search.

But it is not a violent assumption. Cold logic supports it. These are the postulates which, to date, have not been refuted:

(a) All forecasts are for a large and steady increase in the consumption of petroleum products in the United States.

(b) Our present consumption is uncomfortably close to the maximum efficient rate of production of our proved crude reserves.

(c) The productive capacity (MER) of our present reserves will decline through the years.

(d) The trend of new discoveries during the past several years, if continued at the same rate, will not provide enough new crude to meet the anticipated demand for products.

(e) There is no positive assurance, despite the optimism and the activity of our wildcatters, that we will make sensational new discoveries of such magnitude that our domestic reserves will assure us complete freedom from imports indefinitely.

It is important that almost every official who states the assumption of dependence on imports adds the hope that he is wrong and that huge new reserves will be discovered within our borders. Great volumes of arguments are being turned out to prove that the assumption is wrong; they range from detailed analyses of the statistics on which the postulates are based to diatribes against anticipated effects on our purely internal, as distinct from our foreign, oil policy.

But such discussion has not convinced government officials that the assumption is erroneous or premature. It is their firm conviction that the Government is obligated in pru-

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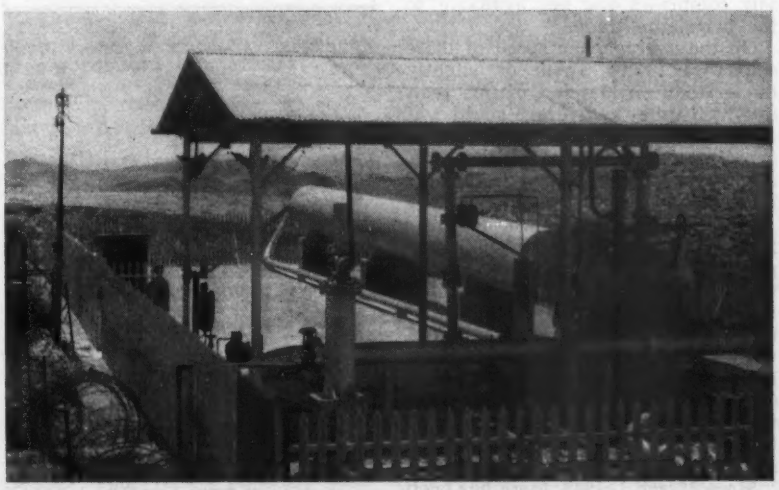
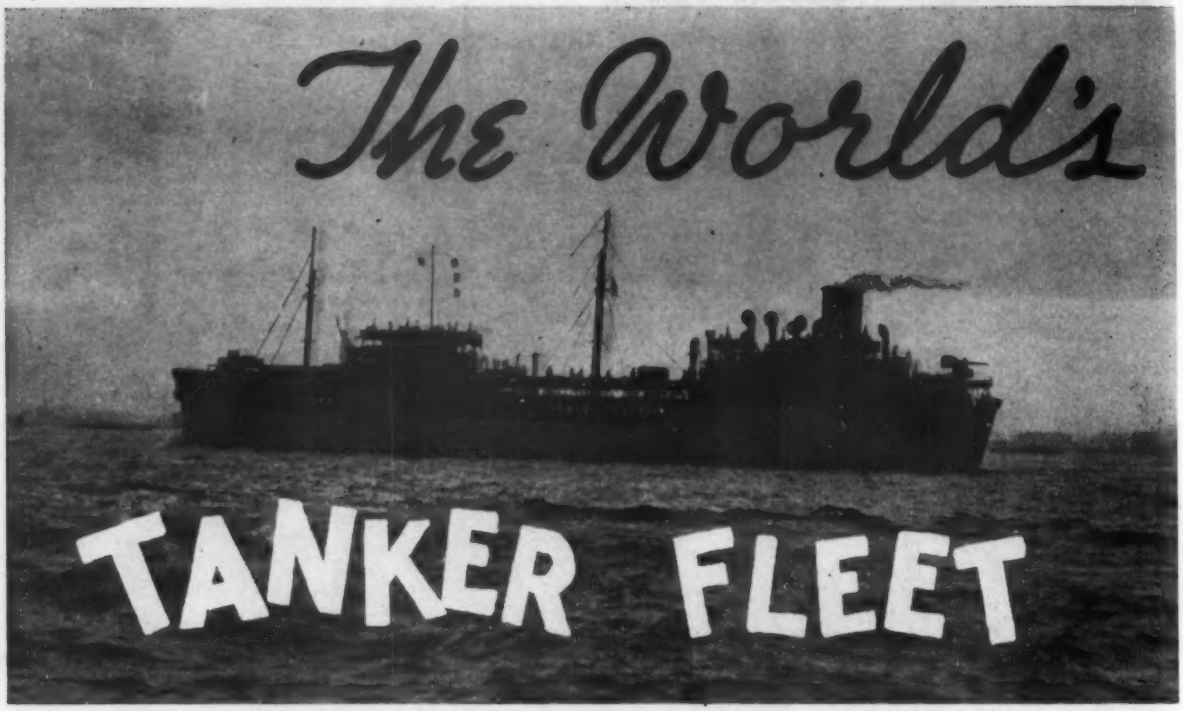


France.—Work operation on a separator serving a pumping well in the region of St. Marcet



WITH the world-wide availability of crude oil and petroleum products largely dependent on the world's tanker fleet, the latest available figures indicate that, as of October 1 1947, there were 1,868 tank ships. Tanker availability for crude oil and products, as of November 15 this year and translated into T2-SE-A1 equivalents, totaled 1,005.

In a report to the National Petroleum Council, NPC's Tanker Transportation Committee pointed out that since the committee's June 10, 1947, report "there has been no substantial change in the carrying capacity of the world's tanker fleet." As shown in "Appendix A," the tankship fleet of T-2 equivalents totaled 1,271, and of this number 1,005 vessels comprised the net available to the petroleum trade.

On the average, the speed of these ships was 13.10 knots or slightly higher than on March 1 of this year, at which time the average speed was 12.94 knots. In 1939, the average speed was 11.01 knots, which shows an increase of slightly more than 2 knots per vessel.

In an anlysis of the world tanker fleet, made for NPC's Tanker Transportation Committee, it was shown that in terms of T2-SE-A1 equivalents, the world tank ships, on October 1, amounted to exactly 1,271.4 vessels of 21,315,000 deadweight tons. In the following review of the world tanker fleet, it should be remembered that the conclusions are drawn from the 1,271.4 figure and not the net available figure of 1,005.

Since March 1, 1947, there has been a decrease of 30 tank ships, in actual number of vessels, but there has been an increase in the carrying capacity of these vessels amounting to 4.4 T2-SE-A1 equivalents resulting from the net effect of scrapping old ships and the construction of newer and faster vessels. Indicative that additional tank ships have been scrapped during the past 12 months is the fact that there were 1,925 tank ships in the world fleet a year ago. *(The Oil and Gas Journal, December 28, 1946, page 161).*

The capacity of the present world fleet is a shade higher than previously, or 0.3 per cent above the capacity on March 1 of this year. By utilizing 120,000 bbl. as the capacity per vessel per trip, it develops that slightly more than 3,500,000,000 bbl. represents the total annual movement

Latest figures show a world tank-ship fleet of 1,868 vessels, with an average speed of 13.10 knots. Of these, the United States fleet numbers 354 vessels, with 167 in the inactive fleet, 176 actually engaged in trade, and the remainder lend-leased and bare-boated to the Army. World fleet tonnage amounts to 21,315,000 deadweight tons. In terms of T-2 equivalents, the world tankship fleet now totals 1,271.

APPENDIX "A"—T2-SE-A1 EQUIVALENT AVAILABILITY OF WORLD TANK SHIP FLEETS FOR COMMERCIAL TRANSPORTATION OF PETROLEUM AND PRODUCTS
(Source: U.S.M.C.)

Item—	World fleets	United States					Total foreign
		Private and Maritime Commission					
		Private	U.S.M.C.	Total	U.S. Navy	Total U.S.	
Total fleet, October 1, 1947	1,271	250	343	593	53	646	625
Sold or final approval	....	44	(124)	(80)	....	(80)	80
Transferred to U. S. Navy	....	....	(50)	(50)	50	....	....
Approved in principle	....	18	(58)	(40)	....	(40)	40
Fleet after transfers	1,271	312	111	423	103	526	745
Availability:							
Military	(144)	25	....	25	(78) (25)	(78)	(66)
Foreign not moving	(55)	....	....	....	....	....	(55)
PDX and constructive losses	(30)	....	(30)	(30)	....	(30)	....
In other than petroleum trade	(37)	(3)	....	(3)	....	(3)	(34)
Net available	1,005	334	*81	*415	....	*415	590

*Includes 55 Z-ET1-S-C3 (Liberty type) tankers equivalent to approximately 26 T-2's.
Note: Parentheses () represent a deduction or minus quantity.

TABLE 1—WORLD TANK-SHIP FLEETS AS OF OCTOBER 1, 1947, ACTUAL NUMBER, GROSS AND DEADWEIGHT TONNAGE AND T2-SE-A1 EQUIVALENT TONNAGE

(Ocean-going vessels 2,000 gross tons and over) Source: U.S.M.C.—Division of Research

Flag—	October 1, 1947			Average		T2-SE-A1 equivalent		
	No.	Gross tons	D.W.T.	Dead-weight	Speed (knots)	No.	D.W.T.	Percentage of world
Western Hemisphere:								
United States	744	6,995,223	11,171,400	15,015	14.07	646.4	10,836,900	50.9
Government	449	4,262,497	6,754,100	15,043	14.26	396.3	6,644,000	31.2
U.S.M.C.	407	3,798,767	6,008,700	14,763	13.87	342.9	5,748,700	27.0
Military	42	463,730	745,400	17,748	17.43	53.4	895,300	4.2
Private	295	2,732,726	4,417,300	14,974	13.76	250.1	4,192,900	19.7
Panama	132	1,063,528	1,688,500	12,791	14.44	100.3	1,681,500	7.9
Others:								
Argentina	28	178,235	251,400	8,978	9.52	9.9	166,000	0.8
Brazil	5	30,183	44,000	8,800	10.21	1.9	31,900	0.1
Chile	2	7,586	9,600	9,600	11.00	0.4	6,700	...
Honduras	2	14,071	21,000	10,500	11.29	0.9	15,100	0.1
Mexico	12	74,122	114,600	9,550	10.50	5.0	83,800	0.4
Peru	1	2,820	4,300	4,300	10.00	0.2	3,400	...
Philippines	...	...	...	...	...	...	...	...
Uruguay	2	20,592	33,600	16,800	14.50	2.0	33,500	0.2
Venezuela	25	72,092	99,300	3,972	9.86	4.0	67,000	0.3
Subtotal "others"	77	399,701	577,800	7,504	10.21	24.3	407,400	1.9
Total Western Hemisphere (excluding Canada and including Philippines)	953	8,458,452	13,437,700	14,100	13.95	771.0	12,925,800	60.7
Europe:								
Great Britain	436	3,252,332	4,789,500	10,985	11.88	234.1	3,924,700	18.4
Norway	195	1,658,333	2,517,300	12,909	12.20	126.3	2,117,400	9.9
Netherlands	80	409,919	570,700	7,134	11.14	26.1	437,600	2.1
France	33	269,155	410,500	12,439	12.27	20.7	347,000	1.6
U.S.S.R.	25	174,696	266,800	10,672	11.83	13.0	217,900	1.0
Germany	4	32,989	50,400	12,600	12.87	2.7	45,300	0.2
Italy	35	248,433	374,000	10,686	12.08	18.6	311,800	1.5
Sweden	36	322,683	491,100	13,641	13.32	26.9	451,000	2.1
Others:								
Belgium	6	47,453	71,600	11,933	12.01	3.5	58,700	0.3
Denmark	11	96,597	149,400	13,581	11.79	7.2	120,700	0.6
Finland	3	21,297	33,500	11,167	10.62	1.5	25,100	0.1
Greece	6	28,235	42,500	7,083	9.84	1.7	28,500	0.1
Poland	1	6,487	9,300	9,300	10.50	0.4	6,700	...
Portugal	5	29,269	44,600	8,920	11.85	2.2	36,900	0.2
Spain	21	121,835	168,800	8,038	11.30	7.8	130,800	0.7
Switzerland	2	11,571	17,900	8,950	10.28	0.9	15,100	0.1
Turkey	1	6,134	9,000	9,000	14.00	0.5	8,400	...
Yugoslavia	1	6,074	9,400	9,400	11.50	0.4	6,700	...
Subtotal "others"	57	374,952	556,000	9,754	11.40	26.1	437,600	2.1
Total Europe	901	6,743,492	10,026,300	11,127	11.99	494.5	8,290,300	38.9
Japan	9	47,805	68,500	7,611	12.65	3.6	60,300	0.3
China	4	30,475	46,000	11,500	10.00	1.9	31,900	0.1
Egypt	1	5,917	7,300	7,300	13.00	0.4	6,700	...
Total world fleet	1,868	15,286,141	23,585,800	12,626	13.10	1,271.4	21,315,000	100.0

possible for the world tank fleet as of October 1, 1947. Converted to a daily basis, there is an indicated total world-wide movement of 9,735,100 bbl. as the capacity of the present world fleet on a 4,500-mile trip.

Another significant measurement is the conversion of the 1,271.4 T2-SE-A1 equivalent number of tank ships in terms of carrying capacity. After giving consideration to distances from Port Said, Egypt, to Marseilles, France, to the United Kingdom and to the United States—in addition to the quantity of oil moved from Gulf to the United States East Coast—and, finally, United States exports to the United Kingdom and Europe, there is indicated an average 4,500 miles per trip world-wide for each T-2 tanker.

As a result of the present situation regarding applications to the U. S. Maritime Commission for tank-ship purchases, being actually in excess of available tank ships, the world-wide construction program becomes increasingly significant. On July 1, 1947, a total of 177 tank ships, with a deadweight tonnage of 2,600,000, was under construction or on order. Of these, orders for 79 vessels amounting to 1,102,000 deadweight tons were placed with builders in the United Kingdom, and 57 ships, having 907,000 deadweight tons, were on order or under construction in Swedish yards.

Therefore, approximately 2,000,000 deadweight tons, out of a total of 2,600,000, are accounted for by construction and orders in the United Kingdom and Sweden. The bulk of these ships, NPC's tanker report explains, are being contracted for registration under the Norwegian and British flags, with the former accounting for 89 vessels of 1,410,000 deadweight tons and the latter having 55 tank ships of 717,000 deadweight tons.

Construction for French Registry

Construction for French registry is third in the order of magnitude and amounts to 15 ships of 222,000 deadweight tons. Sweden accounts for six and the Netherlands for one, with the former being larger on the average than the one for Dutch registry. Four vessels of 40,000 deadweight tons are under construction or on order in United States shipyards. The remaining 9 for a total of 177, are 3 for Spain; 2 for Denmark; 3 for Portugal; and 1 for Canada.

Since March 1, 1947, the total number under construction and on order has increased by 30 vessels for a net change of approximately 530,000 deadweight tons.

With specific reference to the United States tank ship fleet, a decrease of about 14 per cent has occurred in the registrations of our flag since March 1, 1947. This has been due to ship sales by Government whose ownership has declined 24 per cent during the past 7 months, while privately owned capacity has increasel 9.3 per cent during the same period.

Although the Panamanian-flag capacity has more than doubled, being 121.9 per cent greater on a T2-SE-A1 basis than it was on March 1, 1947, the total Western Hemisphere capacity is approximately 6 per cent less on a registration basis than it was 7 months ago. Significant increases have occurred in the British, Norwegian, French, Russian, and Italian fleets since March 1, 1947, so

TABLE 2—WORLD TANK-SHIP FLEETS AS OF OCTOBER 1, 1947, ACTUAL CHANGES IN NUMBER, GROSS AND DEADWEIGHT TONNAGE FROM MARCH 1, 1947, AND SEPTEMBER 1, 1939

(Ocean-going vessels 2,000 gross tons and over) Source: U.S.M.C.—Division of Research

Flag—	Actual changes from March 1, 1947			Actual changes from September 1, 1939		
	No.	Gross	D.W.T.	No.	Gross	D.W.T.
Western Hemisphere:						
United States	—138	—1,203,489	—1,935,800	+361	+4,169,218	+6,737,300
Government	—152	—1,385,171	—2,225,600	+427	+4,076,872	+6,471,500
U.S.M.C.	—151	—1,378,154	—2,214,500	+407	+3,798,767	+6,008,700
Military	— 1	— 7,017	— 11,100	+ 20	+ 278,105	+ 462,800
Private	+ 14	+ 181,682	+ 289,800	— 66	+ 92,346	+ 265,800
Panama	+ 46	+ 447,764	+ 723,100	+ 79	+ 595,468	+ 953,700
Others:						
Argentina	+ 1	+ 3,262	+ 4,200	+ 4	+ 40,433	+ 60,200
Brazil	.....	.....	.....	+ 3	+ 22,283	+ 31,800
Chile	.....	.....	.....	.....	.....	.....
Honduras	.....	.....	.....	+ 1	+ 6,448	+ 9,800
Mexico	.....	.....	.....	+ 10	+ 64,582	+ 100,100
Peru	.....	.....	.....	.....	.....	.....
Philippines	.....	.....	.....	— 1	— 5,236	— 7,700
Uruguay	+ 1	+ 10,296	+ 16,800	+ 1	+ 15,356	+ 25,900
Venezuela	.....	.....	.....	+ 2	+ 7,880	+ 12,000
Subtotal "others"	+ 2	+ 13,558	+ 21,000	+ 21	+ 156,982	+ 239,800
Total Western Hemisphere (excluding Canada and including Philippines)	— 90	— 742,167	—1,191,700	+461	+4,921,668	+7,932,800
Europe:						
Great Britain	+ 18	+ 196,282	+ 320,300	— 6	+ 82,944	+ 85,500
Norway	+ 4	+ 65,237	+ 106,800	— 68	— 414,896	— 608,100
Netherlands	+ 3	+ 11,128	+ 13,600	— 25	— 115,689	— 169,300
France	+ 9	+ 87,342	+ 140,600	— 11	— 43,061	— 51,800
U.S.S.R.	+ 7	+ 65,000	+ 100,800	+ 8	+ 61,646	+ 104,300
Germany	— 1	— 6,135	— 9,100	— 30	— 233,685	— 337,300
Italy	+ 9	+ 89,882	+ 146,400	— 45	— 172,501	— 244,700
Sweden	+ 1	+ 6,382	+ 9,800	+ 16	+ 154,164	+ 234,100
Others:						
Belgium	.....	+ 4,726	+ 8,100	— 4	— 22,976	— 29,500
Denmark	+ 1	+ 9,185	+ 14,400	— 2	— 8,773	— 15,000
Finland	+ 3	+ 21,297	+ 33,500	+ 2	+ 14,748	+ 23,700
Greece	+ 2	+ 10,146	+ 15,100	— 1	— 3,121	— 5,600
Poland	+ 1	+ 6,487	+ 9,300	+ 1	+ 6,487	+ 9,300
Portugal	.....	+ 74	.....	+ 4	+ 26,658	+ 41,400
Romania	.....	.....	.....	— 3	— 14,737	— 22,600
Spain	.....	+ 808	— 500	+ 8	+ 50,964	+ 69,500
Switzerland	+ 2	+ 11,571	+ 17,900	+ 2	+ 11,571	+ 17,900
Turkey	.....	.....	.....	.....	+ 2,411	+ 2,800
Yugoslavia	+ 1	+ 6,074	+ 9,400	.....	+ 2,897	+ 6,100
Subtotal "others"	+ 10	+ 69,918	+ 107,200	+ 7	+ 66,129	+ 98,000
Total Europe	+ 60	+ 585,045	+ 936,300	—154	— 614,949	— 889,300
Japan	— 1	— 2,770	— 2,500	— 38	— 392,636	— 544,000
China	.....	.....	.....	+ 4	+ 30,475	+ 46,000
Egypt	+ 1	+ 5,917	+ 7,300	+ 1	+ 5,917	+ 7,300
Total world fleet	— 30	— 153,975	— 250,600	+274	+3,950,475	+6,552,800

that currently all of Europe has a capacity 12.2 per cent greater than it had 7 months ago. Therefore, in effect little change has occurred in the carrying capacity of the total world fleet, but a marked change has taken place in the ownership of vessels since March 1, 1947.

Comparing this to the fleet as of September 1, 1939, there is indicated a present world capacity greater by 63.9 per cent than the last prewar month. There has been more than a trebling in the capacity of the Western Hemisphere fleet, while European tank-ship capacity has declined 3.5 per cent.

Significant deficiencies on a tonnage basis still exist in the Norwegian and Netherlands fleets with the capacity of the former currently being less than prewar by about 25 T2-SE-1A's, and the latter by about 8 T-2 equivalents. Great Britain's tank-ship capacity is 6.9 per cent above that of September 1, 1939, and 9.1 per cent higher than its level on March 1, 1947, although it now represents only 18.4 per cent of the total world capacity as against 28.2 per cent prewar.

Compared with this shift in ownership, the United States currently has slightly more than half of the world tonnage as against about 25 per cent on September 1, 1939, and 59.2 per cent on March 1, 1947. Privately owned tank ships registered under the United States flag now account for 19.7 per cent of the total world tanker tonnage as against 18 per cent on March 1 of this year and 23 per cent on September 1, 1939.

According to an analysis prepared by the National Federation of American Shipping, it is shown that of vessels 2,000 gross tons and over, a total of 693 tank ships was built under the U. S. Government's program. Of these, 21 had been lost or scrapped as of October 15 of this year and 44 were delivered to the Navy, leaving a net fleet of 628 for other disposition. And also as of October 15, this year, 274 tank ships had been sold and delivered, of which 164 went to United States owners and were registered under this flag for United States citizens. The remaining 66 were sold and delivered to foreign owners.

Thus, the net fleet as of October 15 amounted to 354 vessels indicating that in the first 2 weeks of October, 53 vessels had been transferred from the Maritime Commission's jurisdiction. And of these 354 vessels, there were 167 in the inactive fleet with the remainder containing 175 vessels actively engaged in trade; 3 ships bare-boated to the Army; and 9 tank ships lend-leased to Great Britain and Russia.

Since mid-October, however, the tanker situation has changed rapidly, as the need for additional vessels in service on both domestic and foreign routes became apparent. The Maritime Commission ordered all 96 remaining T2 tankers out of the laid-up fleet and prepared to recondition them, some for sale and some for military use to release commercial-type tankers being operated for Navy account.

The Government also announced it would sell for foreign registry approximately 100 tankers of various

TABLE 3—WORLD TANK-SHIP FLEET AS OF OCTOBER 1, 1947, CHANGES IN T2-SE-A1 EQUIVALENTS FROM MARCH 1, 1947, AND SEPTEMBER 1, 1939

(Ocean-going vessels 2,000 gross tons and over) Source: U.S.M.C.—Division of Research

Flag—	March 1, 1947		As per cent of	September 1, 1939		As per cent of
Western Hemisphere:	No.	D.W.T.	March 1, 1947	No.	D.W.T.	Sept. 1, 1939
United States	—104.1	—1,745,200	86.1	+461.1	+7,730,300	348.8
Government	—125.1	—2,100,600	76.0	+378.9	+6,352,300	2,277.7
U.S.M.C.	—125.5	—2,104,000	73.2	+342.9	+5,748,700	.....
Military	+ 0.2	+ 3,400	100.4	+ 36.0	+ 603,600	306.9
Private	+ 21.4	+ 355,400	109.3	+ 82.2	+1,378,000	149.0
Panama	+ 55.1	+ 923,700	221.9	+ 65.7	+1,101,400	289.9
Others:						
Argentina	— 1.8	— 30,200	84.6	+ 1.0	+ 16,800	111.2
Brazil	+ 0.1	+ 1,700	105.6	+ 1.4	+ 23,500	38.0
Chile	.....	.....	100.0	.....	.....	100.0
Honduras	— 0.1	— 1,700	90.0	+ 0.3	+ 5,000	150.0
Mexico	+ 0.1	+ 1,700	102.0	+ 4.3	+ 72,100	714.3
Peru	.....	+ 100	100.0	.....	.....	100.0
Philippines	.....	.....	.....	— 0.3	— 5,000	.....
Uruguay	+ 1.0	+ 16,700	200.0	+ 2.0	+ 33,500	.....
Venezuela	.....	.....	100.0	+ 0.4	+ 6,700	111.1
Subtotal "others"	— 0.7	— 11,700	97.2	+ 9.1	+ 152,600	159.9
Total Western Hemisphere (excluding Canada and including Philippines)	— 49.7	— 833,200	93.9	+535.9	+8,984,300	327.9
Europe:						
Great Britain	+ 19.6	+ 328,600	109.1	+ 15.2	+ 254,800	106.9
Norway	+ 6.6	+ 110,600	105.5	— 24.6	— 412,400	83.7
Netherlands	+ 0.6	+ 10,100	102.4	— 7.8	— 130,700	77.0
France	+ 8.0	+ 134,100	163.0	— 1.3	— 21,800	94.1
U.S.S.R.	+ 5.6	+ 93,800	175.6	+ 5.4	+ 90,500	171.1
Germany	— 0.4	— 6,700	87.1	— 15.6	— 261,500	14.8
Italy	+ 8.2	+ 137,500	178.8	— 8.4	— 140,900	68.9
Sweden	+ 0.5	+ 8,400	101.9	+ 14.2	+ 238,100	211.8
Others:						
Belgium	+ 0.6	+ 10,100	120.7	— 1.3	— 21,800	72.9
Denmark	+ 0.7	+ 11,700	110.8	— 0.5	— 8,400	93.5
Finland	+ 1.5	+ 25,100	.....	+ 1.1	+ 18,400	375.0
Greece	+ 0.6	+ 10,100	154.5	— 0.3	— 5,000	85.0
Poland	+ 0.4	+ 6,700	.....	+ 0.4	+ 6,700	.....
Portugal	.....	.....	100.0	+ 2.1	+ 35,200	220.0
Romania	.....	.....	.....	— 1.0	— 16,800	.....
Spain	— 0.1	— 1,600	98.7	+ 3.0	+ 50,400	162.5
Switzerland	+ 0.9	+ 15,100	.....	+ 0.9	+ 15,100	.....
Turkey	.....	.....	100.0	+ 0.4	+ 6,700	500.0
Yugoslavia	+ 0.4	+ 6,700	.....	+ 0.3	+ 5,000	400.0
Subtotal "others"	+ 5.0	+ 83,900	123.7	+ 5.1	+ 85,500	124.3
Total Europe	+ 53.7	+ 900,300	112.2	— 17.8	— 298,400	96.5
Japan	.....	— 100	100.0	— 24.6	— 412,500	12.8
China	.....	+ 100	100.0	+ 1.9	+ 31,900	.....
Egypt	+ 0.4	+ 6,700	.....	+ 0.4	+ 6,700	.....
Total world fleet	+ 4.4	+ 73,800	100.3	+495.8	+8,312,000	163.9

TABLE 4—TANK-SHIPS UNDER CONSTRUCTION AND ON ORDER AS OF JULY 1, 1947

(Ocean-going vessels 2,000 gross tons and over). Source: U.S.M.C—Division of Research

For registry	Total world		U. Kingdom		Under construction in: Sweden		France		Netherlands		U. S.		Spain		Denmark	
in—	No.	D.W.T.	No.	D.W.T.	No.	D.W.T.	No.	D.W.T.	No.	D.W.T.	No.	D.W.T.	No.	D.W.T.	No.	D.W.T.
Total world	124	1,728,090	69	950,215	29	409,995	12	206,080	6	73,000	4	45,200	3	32,700	1	10,900
Norway	51	839,050	24	425,000	23	355,150	..	.....	3	48,000	..	.....	..	.....	1	10,900
U. Kingdom	39	475,615	39	475,615	..	.....	..	.....	..	.....	..	.....	..	.....	..	.....
France	13	211,180	..	.....	..	.....	12	206,080	1	5,100	..	.....	..	.....	..	.....
Sweden	6	54,845	..	.....	6	54,845	..	.....	..	.....	..	.....	..	.....	..	.....
Netherlands	6	44,300	4	24,400	..	.....	..	.....	2	19,900	..	.....	..	.....	..	.....
United States	4	45,200	..	.....	..	.....	..	.....	..	.....	4	45,200	..	.....	..	.....
Spain	3	32,700	..	.....	..	.....	..	.....	..	.....	..	.....	3	32,700	..	.....
Denmark	2	25,200	..	.....	..	.....	..	.....	..	.....	..	.....	..	.....	2	25,200

types, both from the laid-up and the active fleets, and the tentative allocation was: United Kingdom, 31; France, 11; Italy, 16; Netherlands, 4; Belgium, 1; Peru, 1; Turkey, 1; Argentina, 3; Greece, 7; Norway, 11; Canada, 4; South Africa, 2; Sweden, 2; Uruguay, 3; Chile, 1. However, domestic applicants protested, and a Congressional committee asked the Maritime Commission to reconsider the decision to sell so many abroad.

In December the commission revised its program again and announced that it would sell all the tankers under its control as rapidly as possible, including about 50 Liberty-type tankers and a number of others, most of which had previously been considered unsuitable for commercial operation because of extensive damage or military features making reconditioning and operation costly.

Under the new plan only 83 of the original 100 T-2 tankers were to be sold for foreign registry, the remainder going to American operators. This brought the total number of tankers sold by the commission to 466, with 140 remaining in the operating fleet. The commission also stopped making new voyage charters for foreign movement, other than that required by the Navy. To release commercial-type tankers for sale, the Navy was preparing to put into service 50 military-type vessels to be operated for its account.

Shipyard delays in reconditioning and demilitarizing the tankers, however, caused a considerable lag between announcements of sales authorized and actual delivery of the vessels, making it difficult to forecast the date on which all tankers would be in operation and under what registries.

10,000,000-Bbl. Daily Demand by 1951

(Continued from page 161)

markets of the world in spite of the Marshall plan.

Currently the largest world exporter is the Caribbean surplus area. While the largest movements from this area have been destined for the European deficiency area, there are large shipments to the United States, Canada, and Latin America. In the future Western Hemisphere destinations will gradually substitute for Europe as the Caribbean's principal customer.

The Near East and Persian Gulf area, often referred to as the Middle East, is today sharing its surplus between the Far East and Europe. With the rehabilitation of Indonesia and particularly with the completion of the big inch pipe lines from the Middle Eastern fields to the Mediterranean, the big European markets will become by far the most important destination for the Middle East supplies. Europe is, of course, the largest deficiency area in the world.

A minor surplus area in the prewar era was the Netherlands East Indies-British Borneo region. As fields and refineries are rehabilitated in that general sector of the world, it is anticipated that it will become a major supplier of the shortage regions of the Far East. Its surplus will offset the declining importance of the United States Pacific Coast as a supplier of crude and products to the markets of the Far East. The United States Pacific Coast, incidentally, may find it necessary to import in excess of 100,000 bbl. per day by 1951, if present estimates of requirements and supplies in that area prove to be accurate.

Compared with the gradual transitions experienced prewar, the above shifts and increases in international movements are almost revolutionary in scope. The problem of providing this international transportation is, of course, essentially a tanker problem. Percentagewise the added requirements for tanker capacity will be greater than the percentage increase in world-wide supplies because of the increasing proportion of the world's total oil which must be tanker borne and because of the increasing average length of tanker haul. It is apparent, therefore, that the tanker situation will have to be kept under close scrutiny and construction plans formulated sufficiently in advance to keep up with the rising level of tanker requirements.

Conclusion

From the above discussion, the tremendous scope of the petroleum industry's job is readily apparent. While the exact figures and time schedules are only partially predictable, the general trends are unmistakable. Despite utmost efforts on the part of the oil industry, there are many uncertainties as to the earliest feasible schedules for completion of the various portions of the vast network of additional facilities. The very substantial quantities of steel—and steel is only one of the major manufactured commodities—which will be needed by each function of the petroleum industry, places strong emphasis on the cooperative assistance required of others outside the petroleum industry if the essential oil supplies herein discussed are to be secured. Because of the many variable factors affecting the exact time when the forecast increases in supply will be realized, it behooves the petroleum industry closely to follow the future supply developments when making added sales commitments.

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KOPPERS PROTECTIVE COATINGS K KOPPERS

BOOKS

NATIONAL PAINT DICTIONARY. By Jeffrey R. Stewart. Published by Stewart Research Laboratory. Box 173, Benjamin Franklin Station, Washington.

This volume is really more than a dictionary—it is an encyclopedia of paint. It covers protective and decorative coatings; raw materials and industrial chemicals; methods, processes and inventions; scientific instruments; trade names of raw materials, and miscellaneous information.

A 600,000-Barrel Daily Production

(Continued from page 165)

is some 5 miles from the crest of the structure.

This increased production will, of course, call for added pipe-line gathering facilities. There are now two 14-in. lines from Abqaiq to Dammam, with 12-in. fork from there to Bahrein and one 10-in. and one 12-in. fork to Ras Tanura. The one to Bahrein, incidentally, is the largest underwater oil pipe-line in the world. It is shielded by cathodic protection.

The company is now building a 20-in. and a 22-in. line from Abqaiq to Ras Tanura.

Meanwhile, development has also started from scratch on a completely new port at Ras Misha'ab in northern Saudi Arabia. Already operating on a temporary basis, Ras Misha'ab will be one of the main ports for the unloading of pipe for the new Trans-Arabian line.

At Ras Misha'ab, vessels will discharge cargo into lighters or on an isolated wharf in the open gulf, 2½ miles from shore, where water is deep enough. An aerial steel cableway, mounted 80 feet above the shallow water on timber A-frame supports in 700-ft. spans, is being erected between the isolated wharf and the material storage and assembly yard on shore. A recently developed gasoline-engine-driven conveyor, called a "skyhook"—equipped with 10-ton hoisting winches and suspended on sheave wheels which run on the cables—will convey cargo from the wharf to the yard.

Located 150 miles from the nearest Aramco habitation, the Ras Misha'ab project will be an undertaking similar in many respects to those undertaken during World War II in preparation for large-scale invasions at isolated points.

Trans-Arabian Pipe Line

The great new Trans-Arabian pipe line will run 1,040 miles from Abqaiq field to a point near Sidon, 30 miles south of Beirut, in the Republic of Lebanon. Scheduled for completion late in 1949, at an estimated cost of $125,000,000, the line will consist of 30 and 31-in. pipe and will deliver approximately 300,000 bbl. of oil to the Mediterranean daily, cutting 2,620 miles from the 3,650-mile marine tanker route.

Leaving Abqaiq, it will pass out of the sands after a few miles, and will then cross open, stony desert and rolling, unbroken, hard-surfaced plains at elevations of from 1,000 to 2,000 ft. From just north of the Trans-Jordan border it will run into the Harrar: the lava beds.

Obtaining materials for the line was more than a little difficult

WeldOlet* Fittings reduce pressure-drop on branch pipe outlets

Engineers concerned with piping are constantly faced with the problem of excessive pressure drop on right angle branch pipe lines. This is due to the fact that conventional branch pipe fittings and welded pipe-to-pipe joints do not provide enough "entrance area" into the branch line and the turbulence created by the sudden change in flow-direction further restricts the effective outlet area.

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In January 1947, Consolidated Steel Corp. of Los Angeles was the only firm having a source of steel available for manufacturing any pipe for the Trans-Arabian project, but its manufacturing capacity was less than 1 mile per day. Accordingly, Trans-Arabian contracted for the pipe and underwrote the cost of additional facilities to increase capacity to 3 miles of pipe daily. The decision to use 30 and 31-in. pipe was made because it permits the smaller to be "nested" in the larger for shipping.

The pipe has a yield point of 52,000 psi., but the line is designed for a working stress of 32,800 psi., or 65 per cent of the yield. New problems of design and construction must be overcome to allow for expansion and contraction due to temperatures ranging from 135° in summer to 20° in winter. Extreme precision will be essential in laying the large, thin-walled pipe to meet these requirements. For example,, misalignment of as little as ½-in. in a distance of 70 ft. will impose an added 10,000 psi. on the bending stress.

Pump stations will be an average of 176 miles apart; and, because of their isolation, each must be provided with water supply, laundry, schools, mosques and churches, commissary, housing, recreational and hospital facilities, and other facilities to meet every human need. In addition, barracks for a small garrison of soldiers must be provided. An adequate airplane landing strip, plus housing for customs and immigration officials, will also be built.

The initial station in Abqaiq field will be a 6,000-hp. steam-driven-turbine centrifugal pump station. The five intermediate stations will each have four 1,700-hp. supercharged diesel-engine-driven centrifugal pumps connected in series, with one standby unit. Two diesel-engine-driven 750-kva. generators will be required for lighting, motor-driven auxiliaries, and other electrical energy demands.

There are no large bays or other well-protected natural harbors along the Mediterranean Coast east or northeast of Alexandria, Egypt. Promontories at Haifa and Beirut undoubtedly provide some shelter from the southwest in Acre and St. Georges bays, but neither of them has visible natural protection against westerly or northwesterly winter gales or storms, and there are no other deep-water inlets or bays with natural shelter.

However, meteorological records indicate that except for a few days during two winter months, gales and storms on the East Mediterranean Coast are not severe enough to interfere with coastal navigation. Based on these records, Trans-Arabian Pipe Line Co. plans to construct at its Sidon terminal a concrete pier to berths for loading tankers in 6 fathoms of water about 2,000 ft. from shore line.

Sidon terminal will have twenty 180,000-bbl. floating-roof tanks located on ground high enough to permit gravity loading of 20,000 bbl. per hour and a maximum turnaround time of 12 hours per tanker.

Factors in Building Line

Involved in the building of the Trans-Arabian line is the recruitment of experienced and skilled personnel, the provision of comfortable camp, housing, hospital, recreational, and subsistence facilities; the procurement of passports; immunizations against communicable diseases; transportation for personnel and baggage nearly half way around the world, and other incidental needs of some 1,500 to 2,000 American personnel.

Expertness and no end of toil are essential in the purchasing of some 400,000 tons of camp equipment, supplies, construction machinery, tools, pipe, building materials, food, and the thousands of other items needed for the work, most of which can be supplied only from sources within the United States. Shipping schedules must be timed to construction schedules and promised deliveries of materials at several U.S. Atlantic, Gulf, and Pacific ports.

Trans-Arabian Pipe Line Co.'s shipping contract is reported to be the largest private peacetime marine

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Obviously, expansion of these proportions must be predicted on the belief that a great and continuing need for Middle Eastern oil is reasonably to be expected. All evidence indicates this to be the case.

Continuing and increasing development of oil reserves everywhere will be necessary to satisfy world requirements which, by all indications, are going to move progressively upward for years ahead.

If such development takes place, there is no reason why the industry should not meet all demands. Supplies, worldwide, are ample. But, if the development does not occur, there will be shortages. Simple arithmetic makes that obvious.

Oil reserves of the Middle East are now believed to have reached approximately 30 billion barrels. Wildcatting, however, has been slowed down, and almost all companies are occupied primarily with production from proved fields. Even in discovered fields, such as Abu Hadriya in Saudi Arabia and Dukhan in Qatar, drilling is only now being resumed.

In spite of this low level of exploratory activity, production from discovered fields is rapidly approaching 800,000 bbl. daily; and it is expected that it will increase still further during the next year, particularly in Saudi Arabia and Kuwait.

In Iraq—not on the Gulf—production is now running at a rate of about 90,000 bbl. daily. Here, the limiting factor is pipe-line outlet. However, Iraq Petroleum Co.'s new 16-in. pipe line to Haifa will permit an increase of Iraq production by 120,000 bbl. daily.

Middle East Pipe Line Co. is planning construction of a 34-in. line, of 500,000 bbl. daily capacity, to extend from Abadan and Burghan to the Mediterranean. It is scheduled to be finished by 1951.

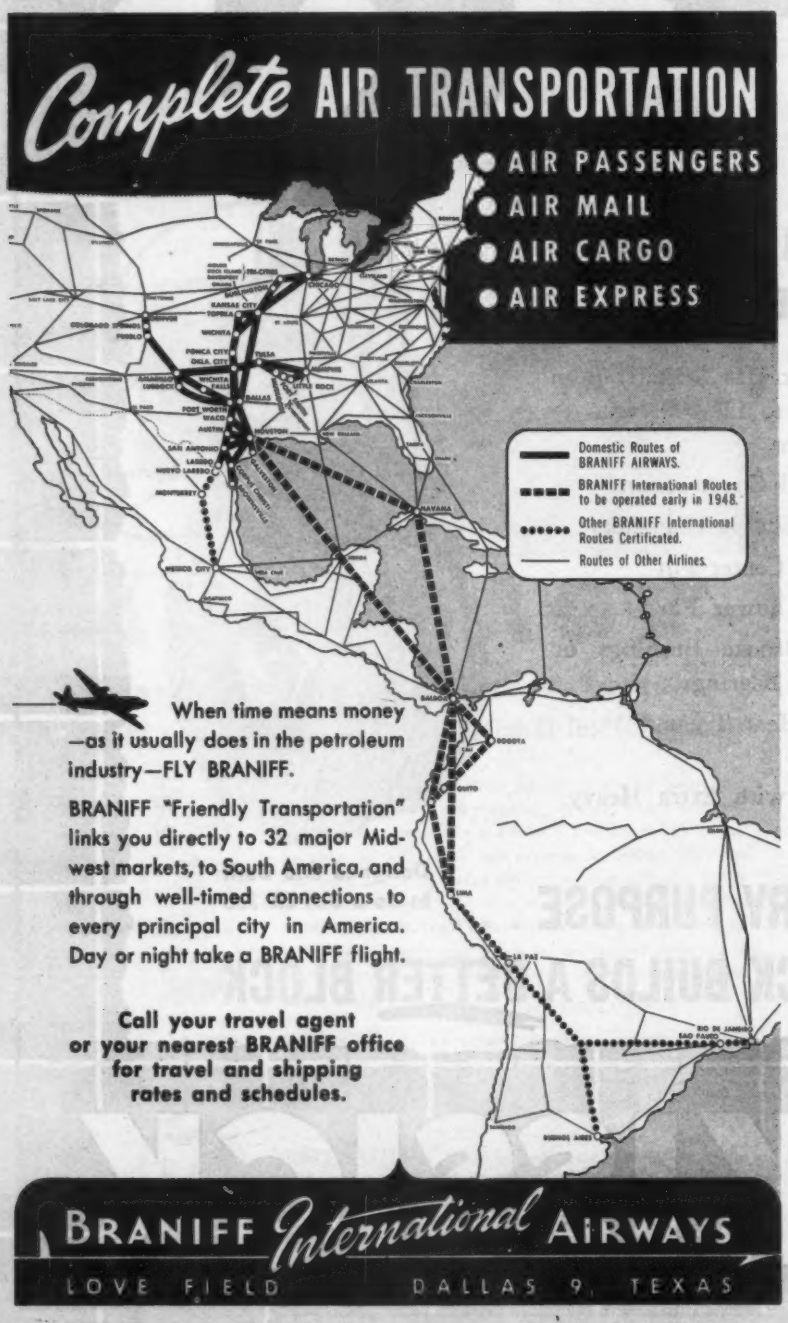
Last of presently scheduled projects—other than Trans-Arabian—is the 24-in. line planned by Iraq Petroleum Co. for construction during 1952 and 1953. Running from Kirkuk field to Tripoli in Lebanon, it will have a capacity of 250,000 bbl. daily.

Completion of all of these lines will put about 1,300,000 bbl. of oil daily on the Mediterranean Coast, although it should be noted that some of these lines are only in the planning stage. Moreover, even if all are built—and on schedule—the oil which they will move is about 100,000 bbl. daily short of the consumption predicted for the 16 Western European countries by 1950, in accordance with information supplied in connection with the Marshall plan. And, it is to be emphasized that this estimate makes no allowance for increases in consumption in western Europe beyond the Marshall plan.

Large amounts of Middle Eastern oil are moving from Saudi Arabia and the other producing countries into refineries on the Mediterranean and in Europe. It is helping to meet the increasing Eastern Hemisphere demand, and doing so without draining our United States resources, and those of the Caribbean, which are being called upon more and more to meet the mounting consumption in our own country.

The great reserves which are being found in Saudi Arabia, Kuwait, Qatar, Iran, and Iraq have a potential for good beyond measure. The moneys which are poured into the Middle Eastern countries as a result of royalties and wage payments will tend to revive and reestablish countries long oppressed by alien rulers whose freedom originated only after World War I. These countries were at one time the center of world civilization. Great cities and enormous irrigation works covered the Babylonian plain. They can all be revived by the financial transfusion which comes as a result of the oil development and can develop their own civilization in freedom if we but give them the technical assistance which they need.

These Middle Eastern reserves, believed by many geologists to be the largest in the world, will certainly be drawn upon more and more, as years pass, to fill the needs of a world that runs on oil.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A Colombian Wildcat Operation

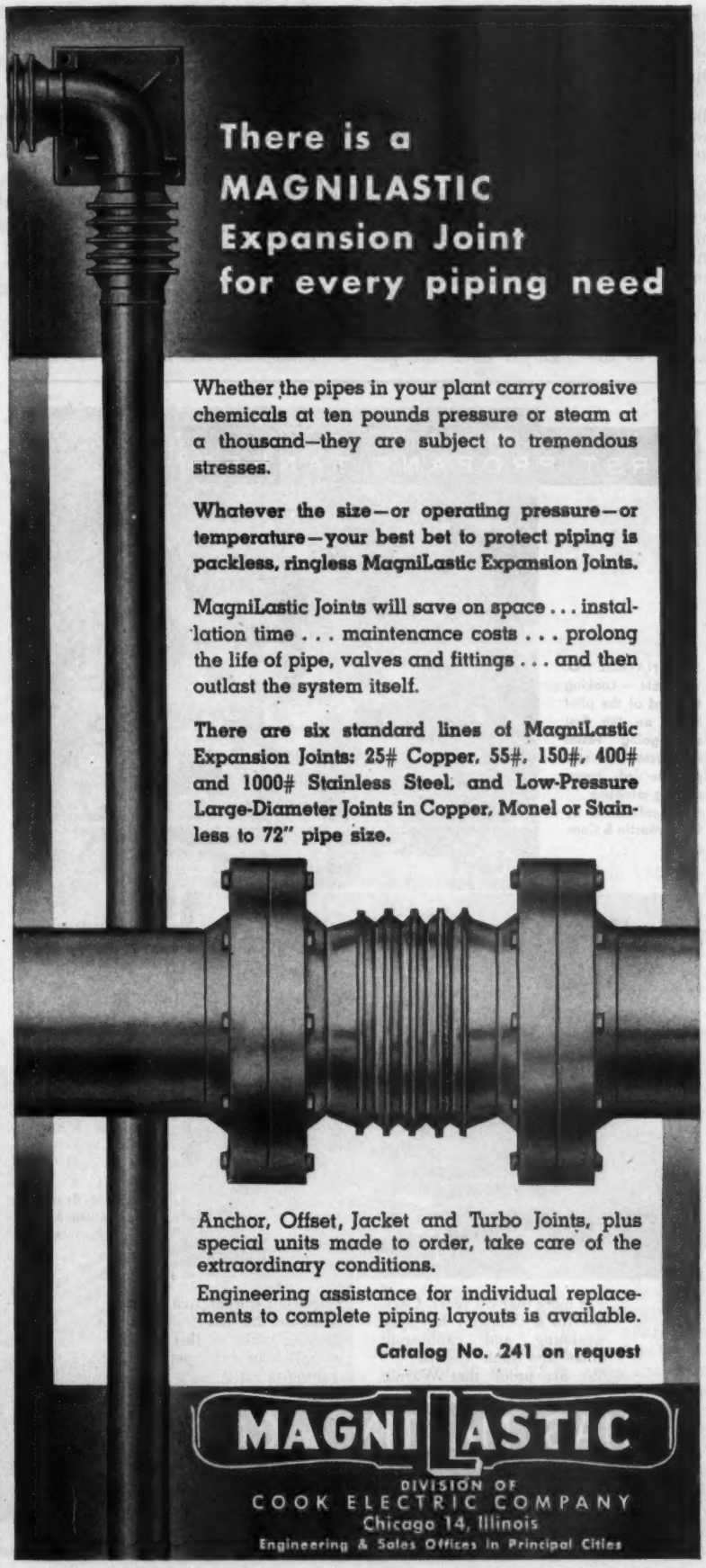
(Continued from page 168)

could be rushed in from the Magdalena Valley. Because of this delay the hole had to be reamed from 4,455 ft. to bottom. From this depth to 6,465 ft. particularly bad hole conditions prevailed. The highly fractured gaseous shales were nearly mudlike in character and contained a large amount of gypsum; throughout this section the formation dip averaged 85°.

Drilling was carried on with four boilers operating under reduced steam pressure which cut down mud-pump volume and pressure. Owing to several shutdowns for boiler repairs an expressive amount of reaming took place. Also, in this portion of the hole it was discovered that if the drill pipe was elevated with the mud pump running the circulation would generally shut off and the drill pipe would stick. On releasing the pump pressure the pipe would pull free with a 20,000-30,000-lb. above-pipe weight pull; finally orders had to be issued to not elevate the pipe with the pump on. Shale gas kept breaking into the mud column particularly during trips with the drill pipe, even after the mud had been weighted to 16 lb. per gal.

By the time 6,477 ft. had been reached hole conditions were such that a protection string of 9⅝-in. casing was set. During the running of the casing the hole heaved in at 5,800 ft. but the casing was finally landed at 6,465 ft. Circulation could not be broken and the casing had to be gun perforated 100 ft. above the shoe. A cement retainer was set between the perforations and shoe and 45 sacks of cement were placed around the shoe. A good cement job resulted.

Four 150-hp., 350-psi. working-pressure boilers had arrived at the well site from the Magdalena Valley and were installed for drilling the 8⅝-in. hole. After laying down the 6⅝-in. drilling string, 4½-in. drill pipe and 5¾-in. drill collars were put into service. Good progress was made in spite of the gas-heaving shales that made it necessary to carry 18 lb. per gal. mud. At a depth of 9,800 ft. a salt-contaminated zone was penetrated and the mud salt content rose rapidly from 3,000 to 25,000 p.p.m. The mud became very difficult to handle, developing abnormally high gel strengths and viscosity rate and excessive amounts of chemical were required to keep the mud pH value at 12. The high-pH starch mud had undergone 5 months of treatment with caustic soda, soda ash, quebracho, and lime, and the additional sodium ions picked up from the salt contamination defeated ordinary control measures. The hole started giving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trouble and at depth 10,276 ft. drilling was suspended in order to condition mud and then run 7-in. extreme line casing.

Experiments carried out in the mud laboratory showed that the high-pH mud could be salvaged by converting it over to a lime-base mud. The resulting lime-base mud had a very low gel strength but as there were not enough mud materials on hand to mix 1,100 bbl. of newly weighted, high-pH mud, the lime base was the only solution to a successful casing job. During the base-exchange reaction between the calcium and sodium ions in the mud, after lime had been added to the high-pH mud, the gel strength rose so high that the conversion had to be carried out on the surface, 100 bbl. at a time. It took 1½ hours to break over each batch using 10 lb. of lime per barrel of mud.

Mud characteristics before and after treatment were:

Weight, lb. per gal.	17.0	16.8
Viscosity, sec. A.P.I.	75	65
Water loss, cc. (30 min.)	3.9	2.4
Cake, in.	2/32	1/32
Init. gel, g. Stormer	60	4
10-min. gel, g. Stormer	200	9
NaCl, p.p.m.	17,000	17,000

On completion of the mud conversion the addition of 1,000 lb. of starch to the 1,100 bbl. of mud readily lowered the water loss from 2.4 to 1.5 cc., and the entire open-hole section was reamed prior to running the 7-in. casing string. The casing was landed at 10,266 ft. in 17 hours' running time and cemented with 700 sacks of cement.

For drilling out, a string of 3½-in. drill pipe with 4⅞-in. drill collars replaced the 4½-in. string, and 6-in. rock bits were used. Some minor difficulties were experienced with the high-weight lime-base mud because of its low gel strength. To offset this a high viscosity rate was maintained and the mud circulated for a complete circulation before pulling any bits. The shale below 10,276 ft. continued to be very badly fractured and had a 90° dip. Shale gas kept breaking into the mud column causing the formation to heave in and resulting in tight hole. At total depth of 10,876 ft. the drill pipe became stuck in heaving shale 30 ft. from bottom after starting out of the hole to change bits.

Mud characteristics at the time were:

Weight, lb. per gal.	17.4
Viscosity, sec. A.P.I.	80
Water loss, cc. (30 min.)	1.2
Cake, in.	1/64
Init. gel, g. Stormer	3
10-min. gel, g. Stormer	8
NaCl, p.p.m.	9,000
pH	11.4

The sticking of the drill pipe was probably caused by a ball on the bit swabbing gas and shale into the hole as it pulled from bottom. The bit started pulling tight 20 ft. from bottom and circulation could not be gained although the bit was worked up the hole a few inches at a time to 10,820 ft. and back down to 10,835 ft. before sticking for the final time. It is estimated that 20+ lb.-per-gal. mud would have been needed to completely overcome the shale gas at this depth. However, in this area, due to the rapid accumulation of fine shale particles in the mud stream, it is very difficult to maintain the viscosity and gel properties of even an 18-lb.-per-gal. mud for any length of time without resorting to water dilution, which, of course, causes extra barytes to be used.

Inasmuch as the drill pipe could not be worked loose, even with mud pressures up to 7,000 psi. which failed to break circulation, it was decided to abandon the well. The abandonment was carried out by backing off the 3½-in. drill pipe at 6,700 ft. and placing a cement plug inside the 7-in. casing from 6,650 to 6,500 ft. Five thousand and five feet of 7-in. casing was recovered after a successful cutting attempt and another cement plug was placed from 5,000 to 4,900 ft. The 9⅝-in. casing was cut and recovered from 2,902 ft. and a cement plug placed from 2,900 to 2,850 ft. A surface cement plug placed inside the 13⅜-in. casing completed the abandonment.

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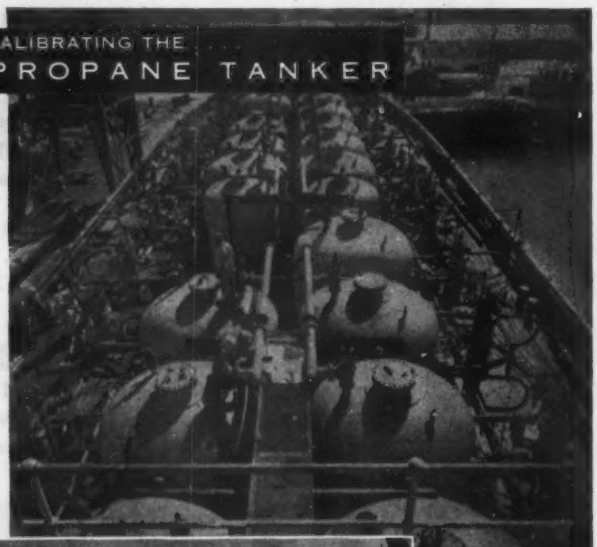

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PIPE-LINE CONSTRUCTION

OUTSIDE U. S. PLANNED FOR NEXT FEW YEARS TOTALS

5,722 MILES OF TRUNK LINES

by Paul Reed

PIPE-LINE construction programs outside the United States which are planned for the next few years will be the greatest in the history of the industry. These activities, largely centered in the Middle East and South America, will involve the construction of 5,722 miles of trunk lines. These lines, together with projects completed in 1947, total approximately 6,944 miles for the principal undertakings.

This year there has been considerable activity particularly in South America. The States Gas Service Department of Argentina commenced an 1,100-mile 10-in. natural-gas line from the Comodoro Rivadavia fields to Buenos Aires. The longest line reported as completed in 1947 is the Socony-Vacuum Oil Co., S. A., 103-mile 12-in. crude-oil line extending from the Oficina area of Eastern Venezuela to Puerto la Cruz. The line has a capacity of 70,000 bbl. daily.

In Colombia, Tropical Oil Co. has completed and put into operation a 125-mile 6-in. products line from Barrancabermeja to Puerto Berrio. The Ministry of Petroleum of Colombia has signed a contract with the Antioqua Railroad for the construction of a 107-mile pipe-line system to handle crude and products between Puerto Berrio on the Magdalena River and Medellin.

Creole pipe-line-pump station in Jusepin field, Venezuela

Yacimientos Petroliferos Fiscales Bolivianos, an agency of the Bolivian Government, is carrying on construction of a 255-mile 6-in. line which began this year and which will continue to be constructed in 1948. The line extends from the Camiri producing area to the new refineries at Cochabamba and Sucre.

Early in January, pipe-laying operations will start for laying a 157-mile 16-in. crude-oil line for S. A. Petrolera Las Mercedes (Texas Co. and Caracas Petroleum Co.) from Las Mercedes field of central Venezuela to Pamatacual, a port in the Puerto la Cruz area. Preparations have been made for early construction of a 155-mile 26-in. crude-oil line from Ule tank farm near Lake Maracaibo to Amuay Bay on the Paraguana Peninsula of Venezuela. Creole is also undertaking construction of a products pipe line from Catia on the seacoast to Caracas, Venezuela.

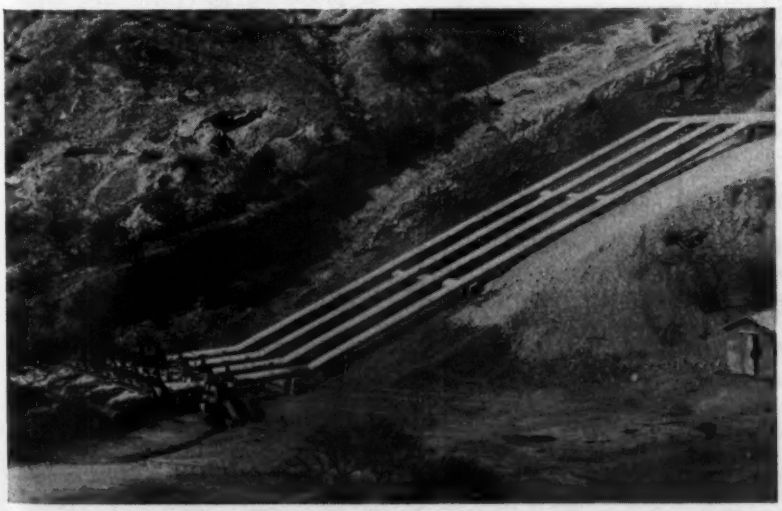
In Mexico, Gas Industrial de Monterrey, S. A., completed a 135-mile 14-in. natural-gas line from Reynosa to Monterrey. Another natural-gas line is projected from Poza Rica to Mexico City by Pemex.

In Brazil studies are being made by the National Petroleum Council for a unique pipe-line system between Santos and Sao Paulo which would comprise lines for handling oil, gasoline, kerosine, diesel oil, gas oil, and crude oil.

Iraq Petroleum Co., Ltd., expects to complete a 16-in. loop in 1948 paralleling its 12-in. line from Kirkuk in northern Iraq to Haifa, Palestine. The construction of another 16-in. loop paralleling the present 12-in. line from Kirkuk to Tripoli, Lebanon, will be completed by 1950. These 16-in. loops will give the Iraq company pipe lines with a capacity of approximately 300,000 bbl. daily.

Plans are being formulated by Iraq Petroleum Co., Ltd., for the construction of a 500-mile 30 and 32-in. line from Iraq's Kirkuk field to the Mediterranean port in the Levant. With two pump stations the line will have a 270,000 bbl. daily capacity. It will be completed in 1955.

The predominant project of 1948 will be Trans-Arabian Pipe Line Co.'s 1,040-mile 30-in. and 31-in. crude-oil line from Abqaiq in Saudi Arabia to Sidon, Lebanon, for which pipe laying will start early in the year. Construction is now under way for 61 miles of 20 and 22-in. pipe line from Abqaiq field to the Ras Tanura refinery by Arabian American Oil Co. This is not part of the Trans-Arabian system. Arabian American Oil Co.'s pipe-line system consists mainly of the Damman field-Ras Tanura 39-mile 10-in. line with 60,000 bbl. capacity, the Damman-Bahrein Island 34-mile 12-in., capacity 62,000 bbl., and the



Manifold of Mene Grande Oil Co. pipe-line system at the Puerto la Cruz, Venezuela, terminal

STATUS OF PRINCIPAL FOREIGN PIPE LINE CONSTRUCTION PROJECTS

Type of lines—	Miles of pipe Completed in 1947	Under way or to start soon	Projected	Total
Crude oil	103	2,924	1,330	4,357
Products	125	117	250	492
Natural gas	995	1,100	....	2,095
Total	1,223	4,141	1,580	6,944

Abqaiq-Damman, 40-mile 12-in. line.

Anglo Iranian Oil Co., Ltd., is preparing to lay a 56-mile pipe line from Agha Jari field to the Persian Gulf port of Mashur to increase exports of crude oil in 1949. Half the line will be built of 20-in. pipe and the other half of 22-in.

Following completion of the Trans-Arabian 1,040-mile project, construction is contemplated for Middle East Pipe Line Co.'s 800-mile 34-in. and 36-in. line from Persian fields to a Mediterranean port.

The existing pipe-line system of Anglo-Iranian Oil Co., Ltd., consists of 8, 10, and 12-in. lines from producing fields to the company's Abadan refinery with an aggregate capacity of about 400,000 bbl. Lines are also in service to carry residual refinery products back to the fields for reinjection.

Bahrein Petroleum Co., Ltd., has a 12-in. line across the narrow water between Bahrein Island and Arabia and an extensive gathering system. Shipping lines from the refinery extend 15 miles to a loading wharf.

In Sweden, Svenska Enterprenad Aktiebolget is planning a 220-mile products line from Uddevalla to Vasteras which probably will be operated entirely with stuffingboxless pumps.

In Russia the 500-mile Saratov-Moscow natural-gas pipe line has been put into operation in recent months. A 360-mile natural-gas pipe line is under construction to connect the Dashiva reserves in the Carpathian foothills with Kiev in the Ukraine.

Mene Grande Oil Co.'s 100-mile 16-in. crude-oil line from the Oficina to the Puerto la Cruz area has the distinction of not only being the first pipe line of such a length in South America but also that of being the first long petroleum line in the world to use pipe larger than 12-in.

Line Paralleled

Creole Petroleum Corp.'s 10-in. line from Quiriquire to Caripito in Eastern Venezuela was later paralleled by a 10-in. line from Jusepin to Caripito. In 1942 the company built a 16-in. line from the Jusepin-Mulata concessions to Puerto la Cruz.

Cia Consolidado de Petroleo (Sinclair) has a 12-in. line from Santa Barbara to Puerto la Cruz with capacity of 50,000 bbl. daily.

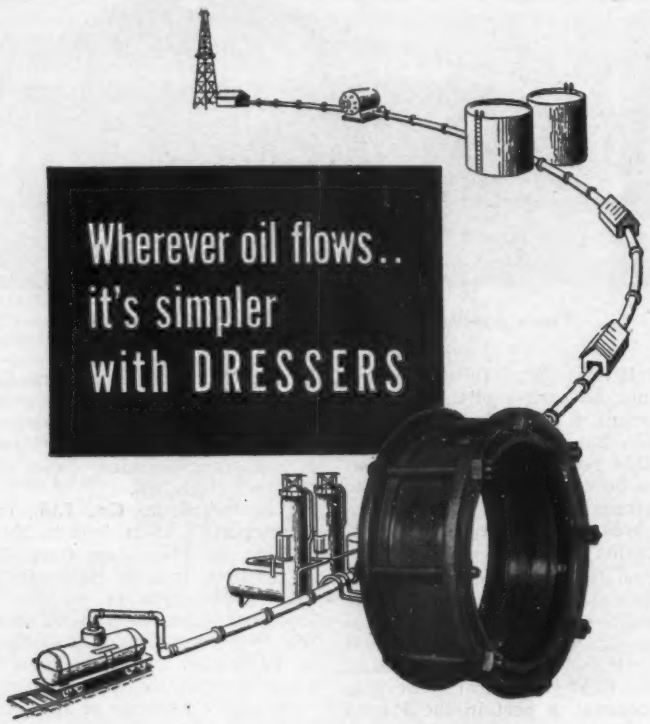
Creole has a 10-in. line from Temblador field to an export terminal on the Manamo River.

In Western Venezuela most of the existing pipe-line systems consist of fairly short lines since the majority of producing operations are rather close to shipping and refinery facilities on the shores of Lake Maracaibo.

Colon Development Co. has an 85-mile 8-in. line with capacity of 20,000 bbl. daily from Los Manueles, Las Cruces, and Tarra fields to a point near Escalante at the mouth of Catatumbo River as it enters Lake Maracaibo. The line goes out into the lake 2 miles to loading piers for loading shallow-draft tankers.

Last year Venezuelan Oil Concessions, Ltd., built a 12-in. line to deliver oil from La Paz, Mara, and La Concepcion fields to a new terminal at Palmarejo on the west side of Lake Maracaibo. By using the Palmarejo terminal, the tanker haul is shorter than the one to the former at Punta Piedras.

Export crude-oil shipments from Tropical Oil Co.'s De Mares concession are transported to a terminal on Cartagena Bay through a 334-mile system, originally built with 10-in



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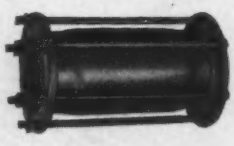

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Refining Expansion

(Continued from page 219)

industry is located along the Gulf Coast to serve the export trade, and Pemex is reported to be planning to dismantle two refineries at Tampico, Bella Vista, and Villa Cuauhtemoc, to use salvable equipment at Salamanca.

Only other North American refinery project is a small topping plant under construction in Cuba to use crude from Jarahueca field which was discovered in 1943 and is now reported to be producing approximately 715 bbl. daily.

South America

Refineries in South America at present have a total capacity of approximately 950,000 bbl. daily. This includes plants on the Caribbean Islands, principally the Aruba refinery of Lago Oil & Transport Co., largest in the Western Hemisphere, which has processed more than 400,000 bbl. daily.

New refinery construction scheduled in South America promises to add probably 300,000 bbl. daily over the next few years. Of this, plans for about 190,000 bbl. daily appear to be fairly definite at this time.

That South America will continue as a net crude-oil exporting area is indicated by forecasts which estimate South American production in 1951 at 1,750,000 bbl. daily. This will exceed anticipated refinery capacity by 700,000 bbl. daily.

Most of the additional South American capacity will be in Venezuela where under the 1943 Petroleum Law companies are required to refine within the country at least 10 per cent of production. Two refineries are now being built on Paraguana Peninsula by Shell and Creole Petroleum Corp., and Mene Grande Oil Co. and Sinclair's Cie. Consolidada de Petroleo are expected to construct refineries of 20,000 and 35,000-bbl. daily capacity, respectively, at Puerto la Cruz in Eastern Venezuela.

Construction work is well advanced on Creole's 60,000-bbl.-daily refinery at Amuay Bay. This entire project—pipe line, tanker terminal, refinery and town—constitutes the largest single building project ever undertaken by the Jersey Standard organization. Cost will exceed $70,000,000. Catalytic cracking equipment will be installed.

The pipe line from Creole's Ule station on Lake Maracaibo will deliver about 300,000 bbl. daily, supplying both the refinery and the marine terminals where six tankers will be able to load simultaneously. Initial operation of the pipe line is expected next year; the refinery, in 1950.

A short distance from Creole's refinery site is the Cardon refinery of the Shell group, the second principal

producer in Venezuela. Shell started initial work at Cardon in 1945, and is reported to be somewhat farther along than Creole. Capacity of the Shell refinery will be 40,000 bbl. daily. Shell also is laying out and building a complete town which will eventually accommodate more than 10,000 persons.

These two projects alone will nearly double Venezuela's present refining capacity of 106,000 bbl. daily, some of which consists of small field topping plants in the interior.

In Trinidad United British Oilfields of Trinidad, Ltd., is building two new asphalt plants near its Point Fortin refinery at a cost of $500,000. Combined capacity will be 275 tons daily. A high-vacuum plant is now under construction, and a continuous-blowing unit will be built later.

Elsewhere in South America and outside the Caribbean area, a number of refinery improvement and construction projects are scheduled. In the definite category are plans that will add some 37,000 bbl. daily to capacity of the area.

The Brazilian Government organization, Conselho Nacional do Petroleo, is planning to construct a new refinery of 2,500 bbl. daily in the Aratu area in Bahia which will operate on indigenous production. Several Brazilian groups have shown interest in building a refinery in the Rio de Janeiro area, and last May it was announced in New York that Refineria de Petroleos do Distrito Federal, S.A., had contracted for a 10,000-bbl.-daily Rio de Janeiro refinery to operate on either Venezuelan or Saudi Arabian crude.

In Uruguay, Administracion Nacional de Combustibles Alcohol y Portland expects to complete in 1948 its program of expanding capacity of Uruguay's only refinery at Montevideo from 6,300 to 13,000 bbl. daily.

Since the discovery of oil in Spring Hill near Chile's southern tip in December 1945, plans for a refinery have been under study by government authorities. Latest reports call for a 10,000-bbl.-daily refinery at Valparaiso by Corp. de Fomento de la Produccion.

In Argentina, Ferrocarrilera de Petroleo is now erecting four coke ovens with a capacity of 10,000 metric tons annually at its refinery at Comodoro Rivadavia.

Yacimientos Petroliferos Fiscales Bolivianos, the Bolivian Government oil agency, now has under construction a 6-in. pipe line extending from fields in the Camiri area to Cochabamba and Sucre. Y.P.F.B. is planning the construction of two refineries, one of 5,000 bbl. daily at Cochabamba and another of 2,000 bbl. daily at Sucre.

Anglo-Ecuadorian Oilfields, Ltd., is preparing to make improvements which will increase the capacity of its La Libertad refinery to 4,000 bbl. daily by 1948. Present capacity of this plant is 2,800 bbl. daily. The increase in operations will meet demands of the local Ecuadorean market.

Several other South American refinery projects are in the less-definite status, or authentic information is lacking.

Europe

Exact information on the European refining situation continues to be obscured by various political and economic developments, though a number of individual expansion programs have been announced. Lack of reports on plants in Eastern European countries under Russian domination, and in some Western European countries, makes difficult any exact assessment of present total European refining capacity.

Compiliations indicate present capacity is approximately 600,000 bbl. daily, not including Germany. European refinery rehabilitation has made considerable progress during the last year, though many plans still remain in the paper stage.

Various expansion projects which have been announced will lift European capacity by about 250,000 bbl. daily. Among these projects is the 120,000-bbl.-daily refinery planned by Agwi Petroleum Corp., Ltd., at Fawley on England's southern coast. The project, meaning in effect the construction of an entire new refinery, is to be completed by 1952 at a cost of $140,000,000. The existing refin-

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ery at Fawley has a capacity of about 15,000 bbl. daily.

Some indication of the prospects for the European refining industry is given by the requests submitted by the 16 Western European nations for aid under the Marshall plan. Under the proposed economic-recovery program, the Western European refineries of the 16 nations involved would be able to handle a total of 740,000 bbl. daily of imported and indigenous crude by 1951. The group of nations proposed to increase refining capacity 250 per cent over 1938 in recommendations to Washington.

A major expansion of European refining capacity of the Shell organization, centered in plants in Great Britain, also was indicated in statements by Sir Frederick Godber, chairman of Shell Transport & Trading Co., Ltd., at the company's annual meeting. Pointing out the importance of Middle East crude in supplying Europe, Godber said the company had decided to erect refineries in England "which, in addition to being the most complete units, will have a capacity in excess of the largest yet erected in Europe."

He said the company believes that in normal circumstances the proper and economical location for all but specialized refineries is at or near the source of production, but added, in view of the shift to Middle East oil, new refining capacity must be so sited as to be available for dealing with all the sources of supply now coming into sight. "This points to Western Europe," he said.

Of considerable interest to the petroleum industry during 1947 was the announcement of plans for the construction of petrochemical plants in the Netherlands and Great Britain. The Shell organization disclosed two new plants will be constructed near its Pernis refinery in the Netherlands. One unit will have an annual capacity of about 2,000 tons of synthetic resins and plastics on completion late next year. The second, which will take crude oil produced in Schoonebeck field near the Dutch-German border as one source of raw material is expected to produce up to 25,000 tons annually of synthetic detergents, soaps, and soap substitutes.

Petrochemical Plant

In Great Britain, Shell is now building a 24,000-ton-a-year petrochemical plant at Thornton-le-Moors. The plant is due for completion in 1948 and production will consist of a variety of olefins, alcohols, ethers, and other products. Shell also is planning expansion of petrochemical production at its refineries at Shell Haven and Stanlow in England.

Another large petrochemical plant under construction in England is that being built on a 120-acre site near Manchester by Petrochemicals, Ltd. The plant, to be in operation towards the middle of 1948, will have a capacity of 50,000 tons annually, producing a full range of aromatics and olefins from a petroleum charging stock.

In addition to the Agwi project at Fawley and the petrochemical plants, several other refinery programs are under way or planned in England. Manchester Oil Refinery, Ltd., has completed expansion of a plant for the production of petroleum-derived surface-active agents and is now making plans to build additional administrative buildings and a large extension to the blending and filling department. Lobitos Oilfields, Ltd., reports a white-oil plant is now being erected at its refinery at Ellesmere Port. Cory Brothers & Co. which operates a refinery at Coryton, Port of London, now has under way an improvement program including enlargement of jetties to increase berthage accommodation for deep-sea tankers, coasters, and lighters and for refinery and public storage operations, extension of the blending and packaging plant for lubricating and technical oils, and modernization of the steam and power plant.

A number of construction projects are slated in France which prewar was Western Europe's largest petro-

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leum refining country. The Monnet plan for restoration of French industry calls for a refining capacity of 205,000 bbl. daily by 1951 as a result of both rehabilitation of existing plants and new construction. The French Government foresees a 300,000-bbl.-daily demand by 1955 and hopes for a refining capacity to handle 88 per cent, or 265,000 bbl. daily.

Soc. Generale des Huiles de Petrole has announced plans for the construction at Dunkirk in northern France of a new refinery of 26,000 bbl. crude capacity which will replace the company's Courchelettes refinery and the war-destroyed Dunkirk plant of Raffinerie de Petroleo du Nord. On completion, the Courchelettes plant will specialize in the manufacture of lubricating oils from distillates obtained at Dunkirk.

Plans for the construction of a new refinery of 31,000-bbl. daily capacity on the Mediterranean coast have been reported. The plant is to be built by Cie. de Raffinage Shell Berre which was formed from the merger of Raffinerie de Berre and S.A. des Petroleum Jupiter (Royal Dutch Shell).

Tannin-Solutizer Unit

A large expansion program is being carried out at two French refineries by Cie. Francaise de Raffinage. At Gonfreville-l'Orcher, the company is installing a 20,000-bbl.-daily two-stage crude-distillation unit and a 16,000-bbl.-daily tannin-solutizer unit. At Le Mede-Martigues, a 20,000-bbl. crude topping unit and a 11,000-bbl. tannin-solutizer unit is being erected.

On the Spanish Canary Islands, Cia. Espanola de Petroleos, S.A., will start work next year on a program to increase production by 50 per cent. The program includes a two-stage distillation unit with a capacity of 5,000 bbl. daily, one furfural extraction unit, 500 bbl. daily, and an MEK, dewaxing, and benzol unit, 450 bbl. daily.

Caltex Petroleum Mij. (Netherlands, N. V., a subsidiary of California Texas Oil Co., Ltd.), has announced work will get under way shortly on a 20,000-bbl.-daily plant 4 miles from Rotterdam on the Rhine River in Holland. The refinery, to be completed by early 1950, will operate on Saudi Arabian crude. Cost is estimated at $18,000,000.

Plans for the construction of several new refineries in Italy have been reported, but definite steps are not expected until clarification of the confused political situation has been effected. Aquila is reported planning to enlarge its Trieste plant during 1948 by several thousand barrels daily, and A.G.I.P. reported studying the addition of catalytic cracking at its Venice refinery. Other Italian interests are said to be planning a new 5,000-bbl.-daily refinery at Venice. Another new refinery of 15,000 bbl. daily at Genoa may be built by the Apri-Deliom group which is controlled by Edison Electric Co. of Milan. Enlargement of the Milan refinery of Permolio also is under consideration, according to reports. Industria Raffinazione Olii Minerali, an A.G.I.P. subsidiary, reports it is planning a predistillation unit of 12,000 bbl. daily capacity and a reforming unit of 2,500 bbl. daily at Porto Marghera, Venice.

Other European refinery-expansion projects include the construction of a butane-propane plant by Cie. Industrielle Atlas at its refinery near Antwerp in Belgium. Raffinerie Belge de Petroles, S.A., also is planning improvements at its Antwerp refinery, including a topping distillation unit of 2,000 bbl. daily capacity, a vacuum distillation unit, a reforming unit, and tanks and accessory equipment.

Middle East

In the Middle East, including Egypt, refining capacity at the present time is approximately 757,000 bbl. daily, including the 420,000-bbl. daily refinery of Anglo-Iranian Oil Co., Ltd., at Abadan in Iran. Several improvement projects have been announced for Middle East refineries, but the only large increase in throughput capacity is scheduled at the Haifa, Palestine, refinery of Consolidated Refineries, Ltd. (Shell and Anglo-Iranian). Additional crude-distillation capacity is being installed at the pres-

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ent time to raise capacity from 63,000 to 84,000 bbl. daily, but long-range plans call for enlarging the refinery to more than double its capacity at 170,000 bbl. daily.

The additional crude oil will be made available with the completion of Iraq Petroleum Co., Ltd.'s new pipe line to Iraq fields. A lubricating-oil plant also is planned for the Haifa refinery.

Present Middle East refining capacity together with that projected will fall far short of being adequate by 1951 when crude-oil production is expected to be increased 800,000 bbl. daily, about double present production. Much Middle East crude oil will go to European refineries, but there is still the possibility some additional processing capacity will be erected along the Mediterranean Coast to handle part of the flow through the Persian Gulf - Mediterranean pipe lines now planned or being built. The Iraq Government is reported planning a small refinery in Iraq, while the French Government has indicated it will build a 20,000-bbl.-daily plant in Syria.

Anglo-Iranian has under construction several improvements at Abadan. The program consists of a 24,500-bbl.-daily catalytic cracking unit, a vapor-recovery plant handling 20,000,000 cu. ft. daily and producing 9,000 bbl. daily of gasoline, and a 400-bbl.-daily lubricating-oil unit.

At another Persian Gulf refinery, that of Bahrein Petroleum Co., Ltd., on Bahrein, an asphalt-manufacturing plant of 50,000 tons annual capacity is nearing completion. The company presently has under consideration an extensive construction project at Bahrein consisting of several additions to the refinery units aimed at balancing out operations. No additional crude-running capacity is contemplated.

The Bahrein refinery is now exceeding slightly its present nominal capacity of 125,000 bbl. daily. Crude-running capacity has been increased substantially above originally designed capacity as a result of various alterations to existing equipment and the conversion of a portion of the fluid catalytic cracking unit to a crude still.

An increase in capacity by modification of existing equipment is planned by Khanaqin Oil Co. (Anglo-Iranian) which operates a 6,900-bbl.-daily refinery in Iraq, supplying local markets.

Other Asia and Australia

In the East Indies—Australia-India area, refining capacity now approximates 150,000 bbl. daily, some of which in the East Indies is still in the process of rehabilitation. No substantial additions to prewar capacity are in sight since construction projects announced will largely restore what was destroyed during the war.

The Palembang refinery of Standard-Vacuum Petroleum Mij. in Sumatra resumed operations in the fall of 1947 and is expected to gradually increase operations to its prewar 45,000 bbl. daily. The condition of Pangkalan refinery of De Bataafsche Petroleum Mij. (Shell) in northern Sumatra is not known, owing to unsettled political conditions. Rehabilitation is being carried out at Shell's Pladjoe refinery. The Shell organization also has announced it will construct a 15,000-bbl.-daily refinery at Muara Bay, British Borneo, to replace the 20,000-bbl.-daily Lutong refinery destroyed during the war.

Burmah Oil Co., Ltd., is preparing to reconstruct its war-destroyed Syriam refinery near Rangoon, but resumption of operations on a prewar scale is not expected for possibly 2½ years. The Syriam refinery had a capacity of 20,000 bbl. daily in 1940.

Two refineries, one an asphalt plant, were scheduled to go into operation in Australia this year. At Paisley near Melbourne a small refinery has been constructed by Vacuum Oil Pty., Ltd. (Standard-Vacuum). Capacity is 1,300 bbl. daily. The second plant will be operated near Sydney by Bitumen Oil & Refining Co. (Caltex Pty., Ltd.), and will have a capacity of 50,000 tons of bitumen annually with resultant quantities of byproducts.

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ARUBA REFINERY PROCESSES

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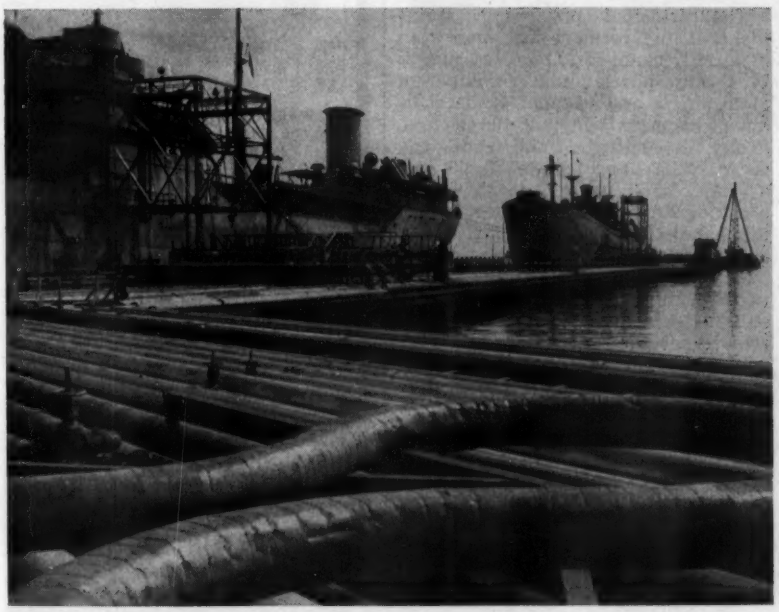
by F. S. Campbell

ONE of the world's largest refineries is located on the small Caribbean island of Aruba, in the Netherland West Indies, and there Lago Oil & Transport Co., a subsidiary of Standard Oil Co. (N.J.), is making substantial contributions toward supplying the world's needs for petroleum products. Although the Aruba refinery covers an area less than 1 sq. mile, its production includes gasoline, kerosine, diesel fuel, distillate fuel oils, residual fuel oils, and cut-back asphalt. It also produces lubricating-oil stocks which are exported for finishing. Today the average throughput of the Aruba refinery is 360,000 bbl. a day.

The barren volcanic and coral island of Aruba contains no oil beneath its surface, but because it has a deep-water harbor it is more convenient for tankers than the nearby oil fields of Lake Maracaibo, 200 miles south, in Venezuela. Specially built shallow-draft tankers, designed to cross the sand bar which separates Maracaibo from the sea, bring Venezuelan crude to Aruba for processing and further transportation.

The first refining operations in Aruba began in 1929, and the initial throughput was 60,000 bbl. a day.



Above: Elevation view of Lago Oil & Transport Co., Ltd., refinery and tank farm. Left: Loading lines at ocean-going tanker dock

At the beginning of World War II Aruba was processing about 225,000 bbl. of crude a day, and the refinery was the largest in the world. During the war the most important contribution which Aruba made to the war effort was the production of 100-octane aviation gasoline, diesel fuel for U. S. Navy submarines, and 80-octane motor gasoline. An aviation gasoline rerun still, a polymerization plant, and a hydrogenation plant had been installed before the war began, so the refinery was in a position to supply the British with 100-octane aviation gasoline during the first 2 years of the war. An alkylation unit was installed in 1939, and a catalytic cracking unit and another alkylation unit were started in January 1943. The cat cracker went on stream in December 1943, and the production of aviation gasoline increased

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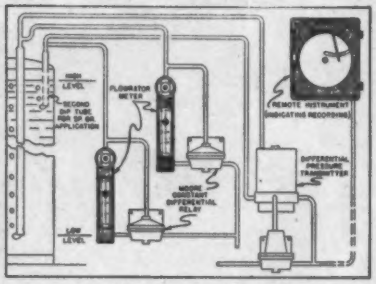
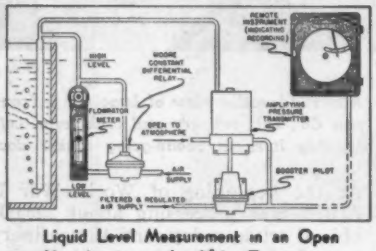
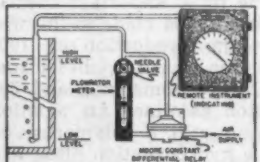


Liquid Level or Specific Gravity Measurement in a Pressure Tank



Liquid Level Measurement in an Open Vessel, using an Amplifying Transmitter



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THE author is presently serving as general assistant in the department of foreign refining coordination of Standard Oil Co. (N. J.). A graduate of Kansas State College, he joined the oil industry as research chemist at the Casper, Wyo., plant of Standard Oil Co. (Ind.) in 1922. When in 1928 Indiana Standard, through its affiliates Pan American Petroleum & Transport Co. and Lago Oil & Transport Co., Ltd., decided to construct a large refinery on the Island of Aruba, N. W. I., Campbell accepted the position of chief chemist of the new plant. Promotions in 1930 to assist general superintendent and in 1932 to general superintendent, at which time the company was purchased by Jersey Standard, followed. In 1938 he was promoted to assistant general manager, in which capacity he served until 1944, when he was transferred to New York to act as secretary of the Caribbean Area Petroleum Committee and of its refining subcommittee, both industry committees under Petroleum Administration for War, until the end of the war.

from 3,500 to more than 15,000 bbl. a day.

Today Aruba has converted from wartime operations. There is no longer as great a demand for aviation gasoline that there used to be, but refinery throughput has been increased from a wartime peak of about 300,000 bbl. a day to the 360,000 bbl. quantity previously mentioned.

Processing Equipment

The principal processing equipment of the refinery has not been materially changed to increase output. The atmospheric and combination atmospheric and vacuum crude stills have a capacity of about 100,000 bbl. a day, depending on the feeds. The rerun stills approximate 70,000 bbl. a day combined capacity. Visbreaking and thermal cracking units can handle 260,000 bbl. a day. There are also a 15,000-bbl.-per-day Model No. 2 fluid catalyst cracking unit, two vacuum pitch or tar-reduction stills, light-ends fractionation and absorption units, a 1,200-bbl.-per-day polymerization plant, a hydrogenation plant of the same capacity, two alkylation plants with a combined capacity of 3,800 bbl., and gas purification and treating units.

The refinery has a storage capacity of more than 14,000,000 bbl.

Besides usual processing facilities, the Aruba refinery contains a 170-ton-per-day sulfuric acid manufacturing plant; an Edeleanu plant for

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making high-quality diesel fuels and kerosine; ethyl-blending facilities for both aviation and motor gasolines; and 120-bbl.-per-day naphthenic acid manufacturing plant. Isolated as it is on an island, the refinery has its own utility services; electricity; steam; sea-water pumping facilities in excess of 260,000,000-gal.-per-day capacity; brackish water wells; compressors; liquid nitrogen; and refinery burner gas.

The refinery's 7,500 employes all live on the island. The settlement consists of a variety of dwellings, bungalows, and dormitories. It includes a church, school, golf course, tennis courts, and beaches. A commissary and mess hall are provided. All of Aruba's fresh water is imported at an average rate of 12,000 bbl. a day in specially fitted tankers.

Delivery by Tankers

Despite its small size, Aruba is well among the 10 great ports of the world on a tonnage basis. All of the oil for the refinery is delivered by tankers. Turnaround at the port has on occasions averaged over 675 ships monthly—about three quarters of which were shallow-draft tankers adapted to the waters of Lake Maracaibo in Venezuela. Postwar rehabilitation of the refinery has included dredging and dock construction which will permit handling more and larger tankers with improved turnaround.

When the war ended the greatest change in petroleum product requirements—world-wide—occurred in gasoline. The armed services canceled requirements for practically all aviation gasoline and for much of the motor gasoline. Although civilian gasoline demand increased with the elimination of controls on consumption, the drop in high-octane-quality requirements has allowed greater flexibility in refinery operations, and considerable revision in the operations of the Aruba refinery has been possible.

Toward the end of the war Aruba was running about 19.1 per cent gasoline on crude, together with 1.0 per cent kerosine, 13.7 per cent middle distillates, and 64.9 per cent residuals.

Peacetime requirements have enabled the refinery to modify its operating procedure. Both the polymerization and hydrogenation units have been shut down because the production of gaseous olefins has been reduced and can be handled by alkylation.

Present operations consist essentially of distillation, mild vis-breaking, and catalytic cracking at the rate of about 25,000 bbl. per day feed rate. Thermal cracking of gas oil has been discontinued, which has made the cracking coils available for straight distillation and vis-breaking.

The net effects of the present operations have been to increase middle distillates, including heating oil, diesel fuel, and gas oil. Present yields are approximately 16.7 per cent gasoline, 4.8 per cent kerosine, 14.5 per cent distillates, and 63.9 per cent residuals. The increase in output without expansion of refinery facilities has been accomplished mainly through the elimination of bottlenecks, and by decreasing high-octane-gasoline production.

Aruba's increased throughput, without material physical changes in equipment, is in accord with world-wide postwar trends. It is probable that refinery expansion in the foreign field will be accomplished through new refinery construction or rehabilitation of war-damaged refineries to a greater extent than through expansion of existing refineries. Principal refinery construction may be expected in Europe, the Mediterranean area, the Persian Gulf, the East Indies, and Latin America. New refineries will be near the sources of crude, and if the net increases in requirements are principally in residual fuel, as is expected, the new equipment required for existing operating refineries will be relatively slight.

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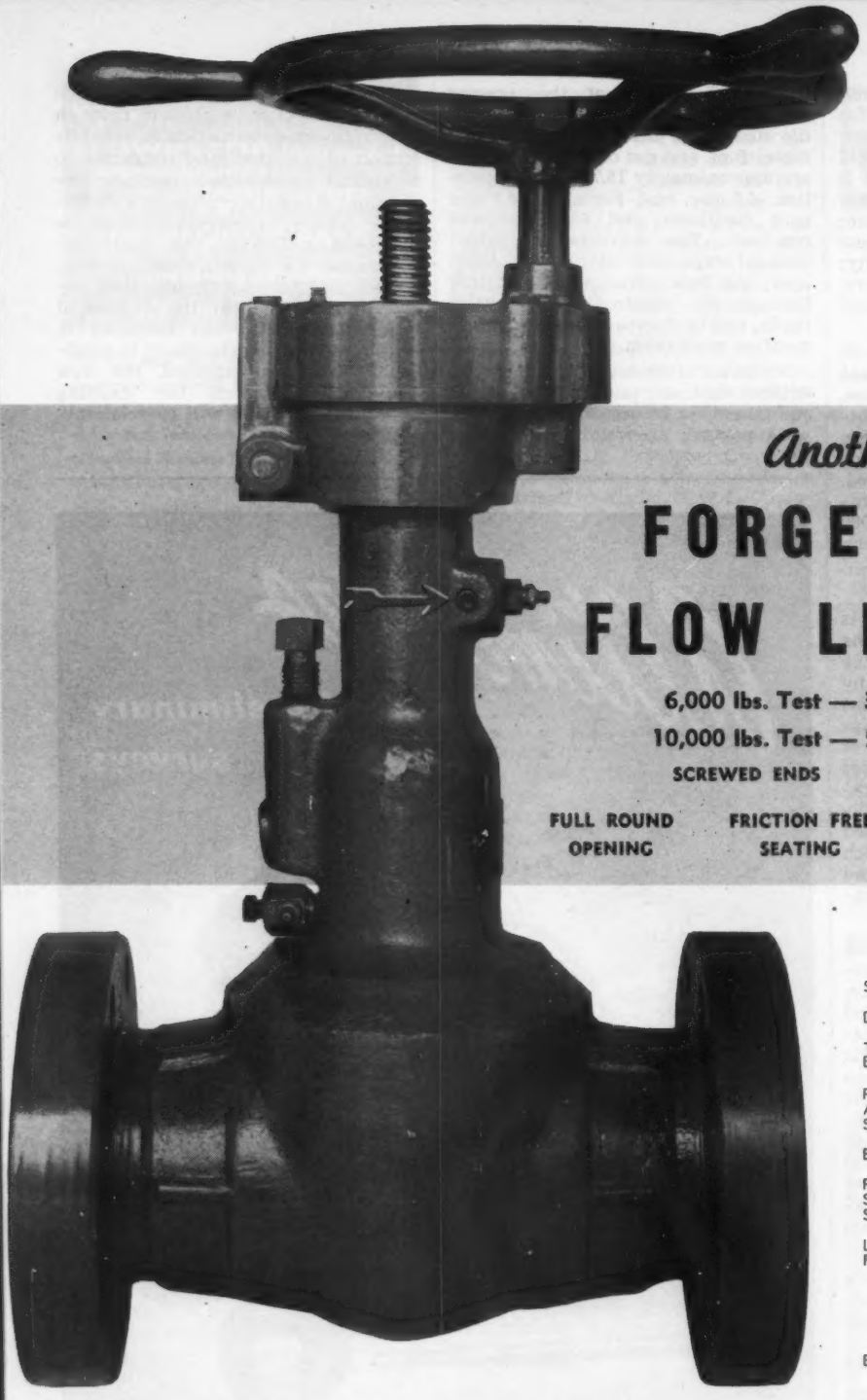

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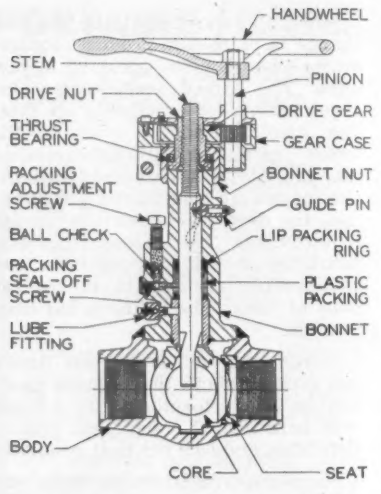

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CONSERVATION and UTILIZATION of Natural Gas

A REVIEW OF PERUVIAN OPERATIONS

by R. E. Moyar*

THE operations under discussion refer to the La Brea-Parinas Estate of International Petroleum Co., Ltd., located on the Pacific Coast of northwestern Peru, at the most westerly tip of South America. The estate, which has an area of 643 sq. miles, is irregular in shape with an over-all extent of some 20 miles to the north and south of Parinas Point. (Fig. 1).

Locally on the La Brea-Parinas Estate there are five producing formations in the Eocene section, namely, from youngest to oldest; Verdun, Talara, Parinas, Pale Greda, and Salina. These formations which occur in the coastal area produce from sandstone beds usually a few feet in thickness interbedded in greater thickness of shale. The Parinas sandstone is the one exception, for this formation is essentially a massive sandstone varying in thickness up to a few hundred feet. This formation is the most prolific producer and although it has accounted for about 70 per cent of the crude oil production, it is developed over only a very small part of the coastal zone of the estate. The relative importance of the different producing formations is indicated by Table 1, which shows the percentage of total gas that has been produced from each.

*International Petroleum Co., Ltd.

TABLE 1

Formation—	Per cent of total gas produced	Per cent of total gas injected
Verdun	8.4	2.0
Talara	0.4	0.0
Parinas	59.2	91.0
Pale Greda	1.0	0.2
Salina	31.0	6.8
	100.0	100.0

The structural traps responsible for the accumulation of oil are the result of an intricate system of block faulting in which stratigraphic displacements vary from practically nil up to several thousand feet. The complexity of the fault block pattern

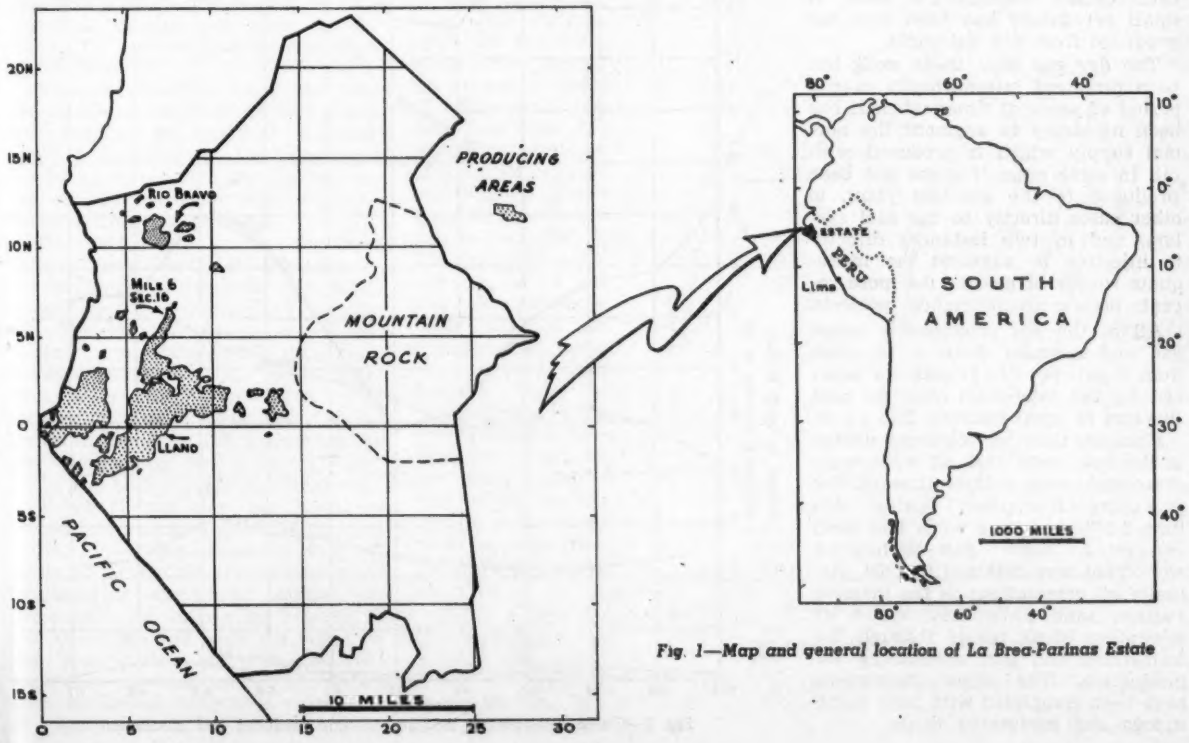

Fig. 1—Map and general location of La Brea-Parinas Estate

has reduced the areal extent of any reservoir discovered to date to less than 400 acres, and without exception numerous minor faults have further reduced the effective areal extent of smaller producing units within the reservoir.

In virtually all cases the oil encountered in the Eocene sediments on the estate has been initially saturated with gas, containing between 350 and 500 cu. ft. per barrel. In the Parinas sand gas caps are relatively common—for the most part comprising an estimated 12 per cent of the productive volume of the individual reservoir. During the early development of the field between 1885 and 1925 virtually all production was obtained by gas drive aided by gravity drainage. Since 1925 major portions of the produced gas have been injected to the Parinas sand in numerous repressuring, pressure drive, pressure-maintenance operations, and more recently in an experimental recycling project. Undoubtedly, unaided gas-cap drive has been effective to some extent in many areas and in recent years when free gas was known to exist above the oil, efforts have been made to utilize the expansion of the gas cap to best advantage.

Producing Operations

It is estimated that of the total of 330 billion cubic feet of gas that has been produced from the estate at least 80 per cent was dissolved gas produced from the crude. A considerable portion, probably 20 per cent, has been produced from gas caps or injected gas produced after having been cycled through the sand. A small percentage has been free gas produced from dry-gas wells.

The dry gas from these wells has been produced intermittently over a period of years at times when it has been necessary to augment the normal supply which is produced with oil. In some cases this gas has been produced to the gasoline plant, in other cases directly to the fuel system, and in two instances directly to injection to augment the inadequate supply of gas for the more recent pressure-maintenance projects.

All of the gas produced is sweet gas and contains from 1 to more than 6 gal. per M.c.f. with an average for the total field over the past 10 years of approximately 2.75 g.p.m.

From the time developments started in the field until 1939 all wells were completed with a liner through the producing formation. During this time 2,300 producing wells had been completed. Since gun-perforating equipment was obtained in 1939, virtually all completions in the massive Parinas sand have been made by cementing blank casing through the formations and gun perforating for production. The other formations have been completed with both blank strings and perforated liners.

Completion by gun perforating has permitted much more efficient operations than had previously been obtained, as it permitted more efficient utilization of the natural gas in the reservoir, has prevented waste of gas from the gas caps which normally is produced with the oil in a liner completion, has greatly increased the crude-oil recovery by permitting better control of injected gases and gas-cap expansion, has aided gravity drainage, and has permitted the isolation of producing zones within the formation by preventing interzonal communication within the well bore.

Of the present 2,300 producing wells on the estate 94 per cent are pumping. The casing is connected into the flow line of all pumping wells and the gas produced from the annulus is carried through to the field tank battery where it is separated from the oil and then carried through vacuum lines to the natural-gasoline plant. Field storage batteries are tied into the vacuum system which permits the collection of all vapors from these batteries. In the case of flowing production the gathering system is similar with the exception that the casing annulus of flowing wells is not connected to the system.

In several areas where operating conditions permit, two-stage separation is used. Gas from the first stage in the two-stage system is dry enough that extraction is unnessary and amounts to approximately 95 per cent of the gas that passes through the stage separators. This gas is frequently delivered directly to the fuel system. In cases where it is delivered to the gasoline plant under pressure and is recompressed, a considerable saving in plant horsepower is effected by bypassing the lower stages of compression. In many isolated areas small quantities of gas are delivered from the well directly to the fuel system either in the field or to the company refinery at Talara. However, of the total daily pro-

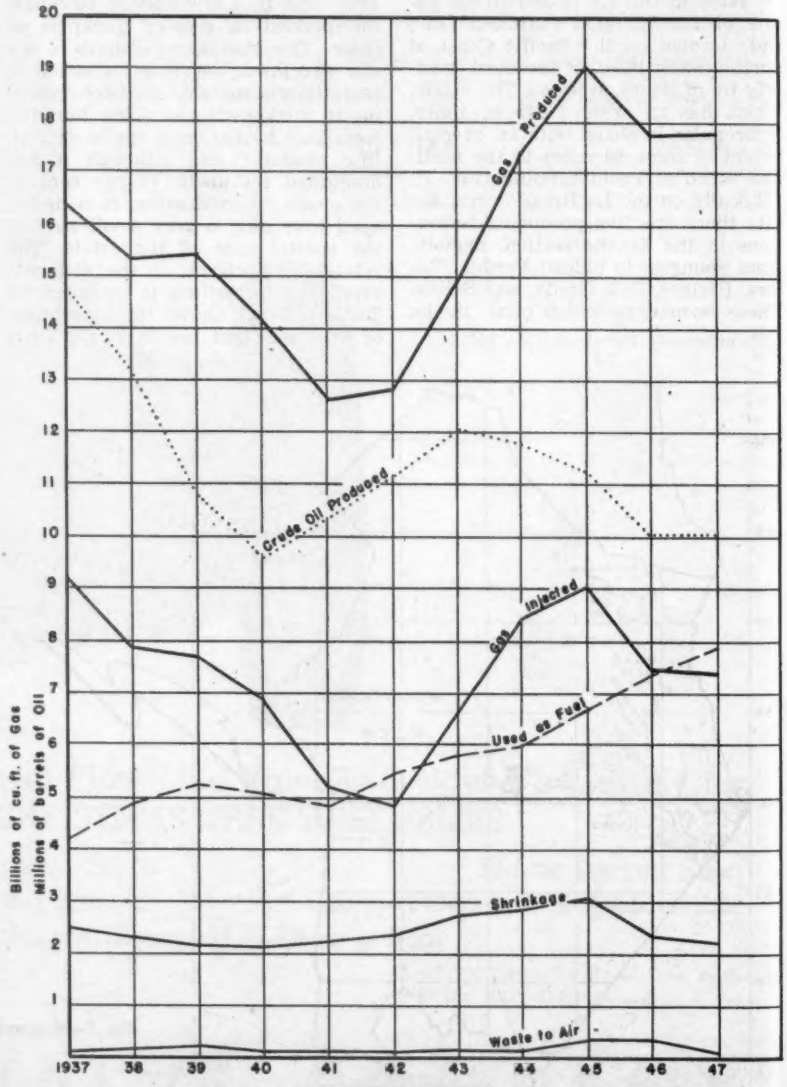

Fig. 2—Crude oil produced and natural gas produced and distributed

duction of gas, which is approximately 47,000,000 cu. ft., 97 per cent is delivered to the gasoline plants for processing.

There are six natural-gas plants operating on the property which have a combined capacity for handling raw gas of 53,180,000 cu. ft. per day. They are all absorption plants and are served by one centrally located distillation unit. To effect this operation lean oil is circulated from the central plant to each of the remote installations where it passes through absorbers and is returned to the central distillation unit through rich oil lines. The absorbers in this system range in operating pressure from 20 to 340 lb.

The vacuum systems are so planned that five of the six plants which are located in the central producing area are interconnected. This system provides considerable flexibility and greatly reduces the waste of gas lost to the air in the event any of the five plants are down either during an emergency or for short periods for repairs. The residue gas from the plant after extraction contains approximately 0.5 gal. per thousand feet which is an indication of the efficiency of the extraction process. Of the total gas processed approximately 15 per cent is lost by shrinkage due to gasoline absorption.

Utilization of Gas

Of the total produced gas less than 2½ per cent is lost through waste to the air. This condition has prevailed for the last 20 years and is shown for the period 1937-1946 on Fig. 2. Eighty-five per cent of the gas delivered to the plants is produced as residue gas after extraction of the natural gasoline and other liquid products.

Products obtained from the wet gas which is delivered to the plants are: residue gas, natural gasoline, propane, and butane. At present plans are being formulated for the extraction and separation of higher hydrocarbons from the gasoline.

The residue gas is used for field and refinery fuel, for injection to the producing formation, and small quantities for producing oil by gas lift. The greater portion of the injection, approximately 75 per cent, is returned for injection to the pressure maintenance operations. The smaller portion, 25 per cent, is injected in the older and depleted areas for repressuring and pressure drive.

For the past 2 years approximately 1,000,000 ft. per day has been injected into an experimental recycling project, covering approximately 90 acres, to determine the efficiency of repressuring operations carried on since 1926. An interesting feature of this operation has been the fact that gas passing through this depleted reservoir absorbs sufficient liquid ends to permit profitable extraction of gasoline even though the gas is produced at ratios as high as 20,000 cu. ft. per barrel. However, it would not be profitable if new plant installations were required.

TABLE 2—DISTRIBUTION OF FUEL GAS

Year—	M.c.f. to field fuel	M.c.f. to fuel gasoline plants	M.c.f. refinery	Total field
1947*	4,250,000	1,850,000	1,810,000	7,911,000
1946	3,604,005	2,113,340	1,756,777	7,474,122
1945	2,945,576	1,958,350	1,884,031	6,787,957
1944	2,803,369	1,904,130	1,342,610	6,050,109
1943	2,655,202	1,762,284	1,401,134	5,818,620
1942	2,339,037	1,567,697	1,601,674	5,508,408
1941	2,233,769	1,679,631	986,099	4,899,499
1940	2,185,656	1,653,168	1,311,318	5,150,142
1939	1,870,433	1,969,123	1,510,783	5,350,339
1939	2,162,713	1,830,394	973,656	4,966,763
1937	1,969,001	1,772,729	583,765	4,325,495

*Volumes for 1947 estimated.

For many years excess gas was stored in one reservoir, Bella Vista Parinas sand pool, close to the refinery. This storage reservoir was so connected that should any failure in the field fuel system develop such that it would cut off the suuply of fuel gas to the refinery a shutdown could be averted by drawing gas from the storage reservoir. Currently, the Section 16 pool, although not a storage project as yet, is connected for an emergency source of fuel.

Repressuring and pressure-drive projects have been attempted in almost every pool discovered to date. However, the results have been negligible in the pools that were not producing from the Parinas sand. Of the total of 128 billion feet of gas injected to date, 50 billion or 39 per cent has been injected to the sands of the pressure-maintenance operations discussed below in more detail. The remaining 61 per cent or 78 billion cubic feet have been injected in Parinas sand pools for purposes of pressure drive or repressuring and have exerted a considerable effect on the total cumulative crude production to date. However, no evaluation of the results will be made.

Table 2 shows the distribution of residue gas delivered to fuel. It shows the total fuel which is used by natural-gasoline-plant operations, by the refinery, and by field fuel which serves drilling operations, production operations, the power plant, water plant, and that consumed for domestic purposes in the workmen's homes. The total demand for all of these operations with the exception of the refinery is supplied by the field fuel system. The refinery fuel requirements are supplied in part by refinery waste gases.

A minor portion of the residue gas, from 2 to 2½ per cent, is used for

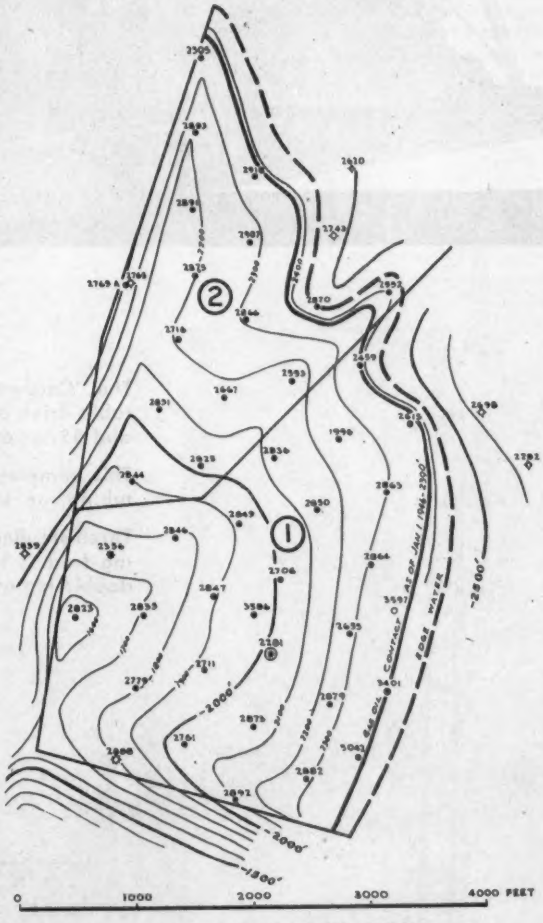

Fig. 3

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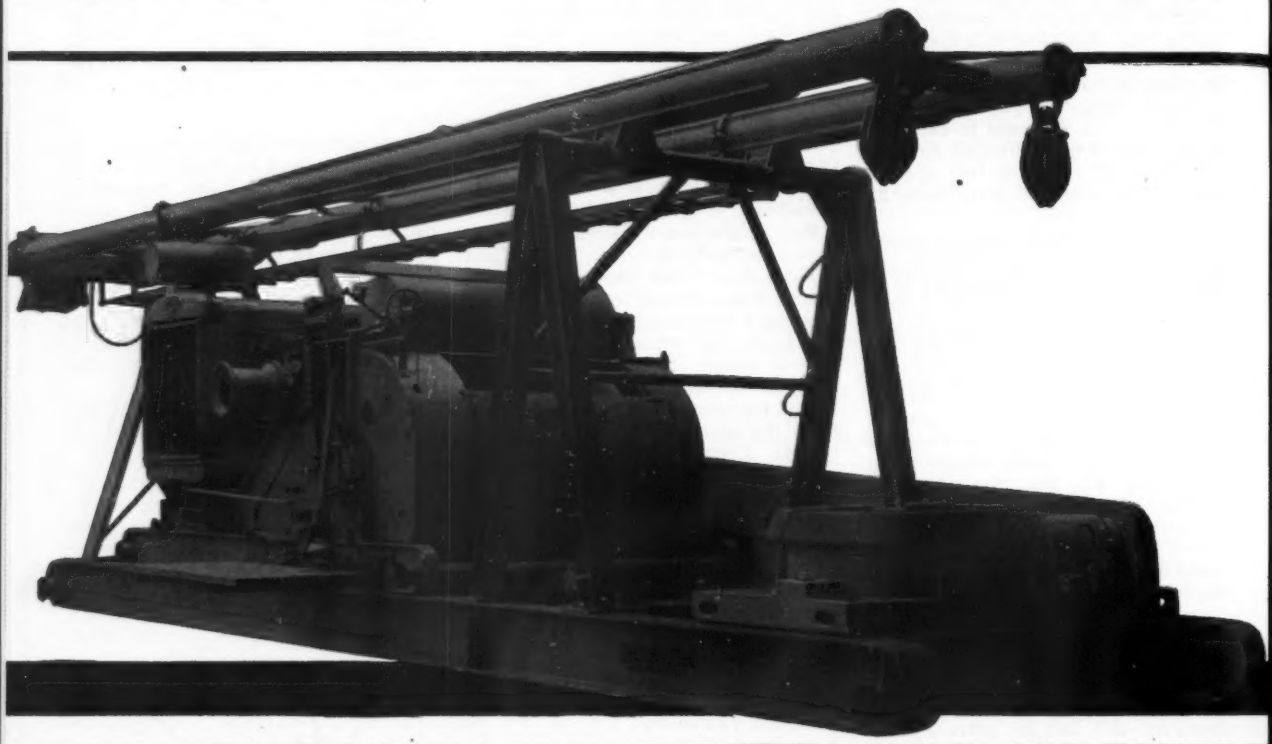

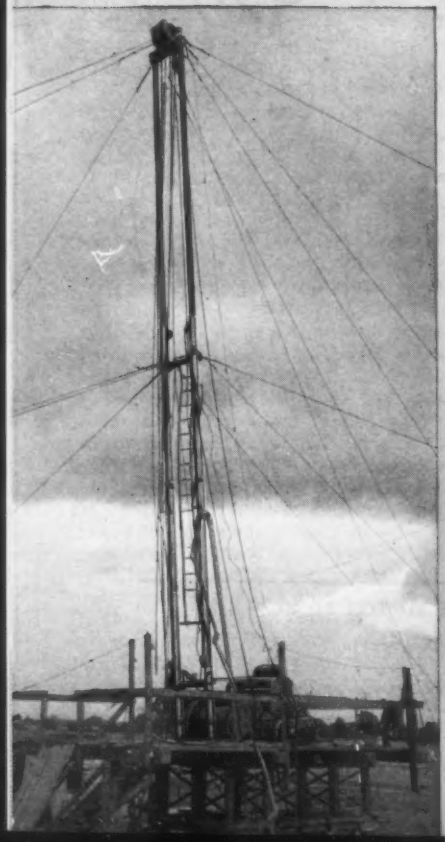

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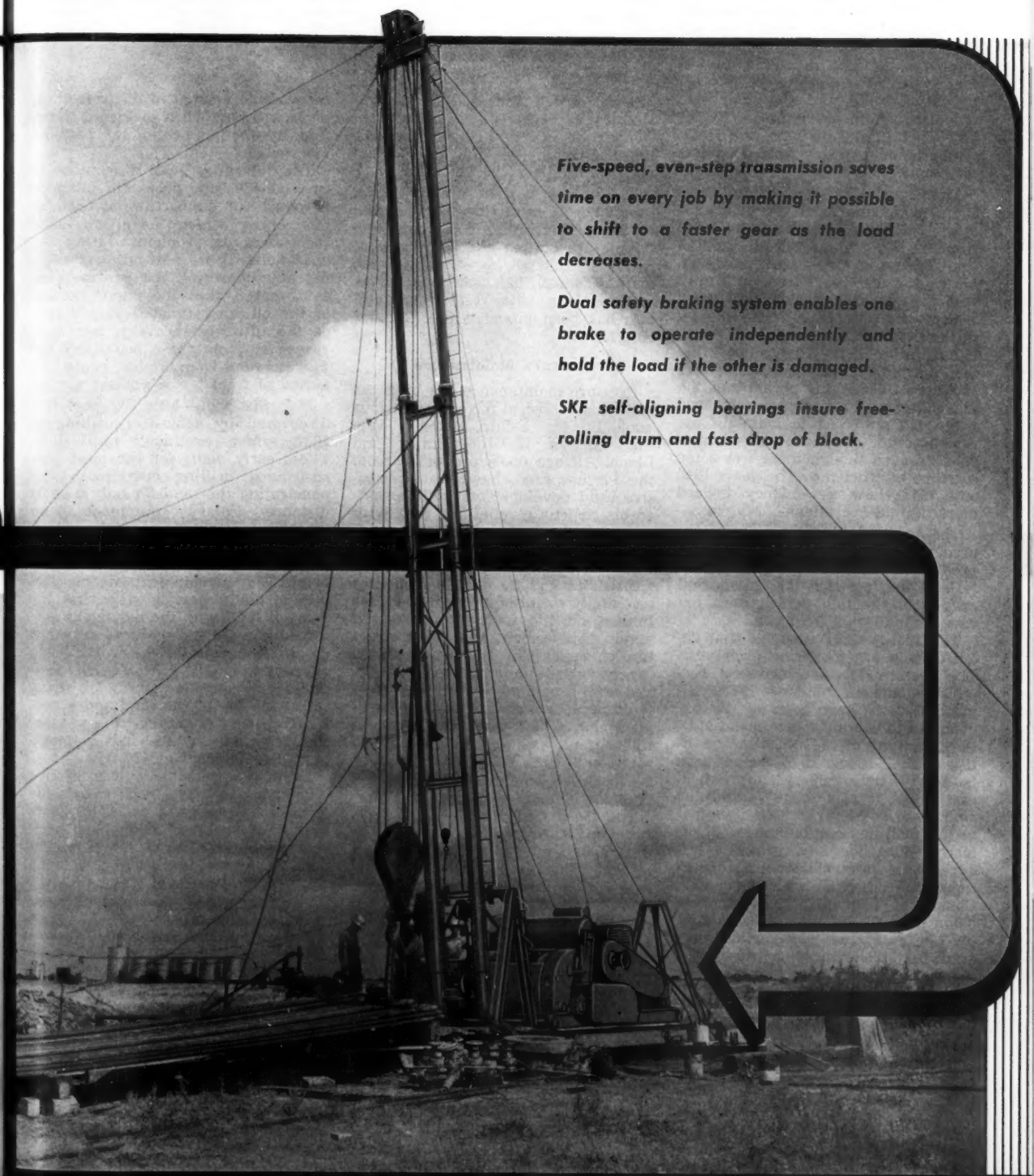

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producing crude by gas lift. On the La Brea-Parinas Estate gas-lift operations are not extensive, but are used for completing and cleaning up new wells and for producing wells for short periods when pumping equipment is not available.

Fig. 2 is a graph covering the years 1937 through 1946, and an estimation projected for 1947, indicating the total gas production, total residue gas delivered for injection to the sands, total residue gas delivered to the fuel system, the quantity of gas lost by shrinkage through the plant with the production of natural gasoline and other liquid products, and finally the amount of gas wasted by loss to the air.

The total-gas-production curve shows a decline from the year 1937 until 1941, which follows the general trend of the declining crude production during those years. However, during the war years from 1942 until 1945, the gas-production curve showed a very sharp increase, even though the rate of crude production was declining after 1943. This reflects the fact that several dry-gas wells were produced during this period and the fact that gas-oil ratios were permitted to rise in an effort to maintain the rate of crude production as high as possible even though there was some sacrifice in efficiency. The years 1946 and 1947 show a tendency toward more normal operations.

The curve indicating residue gas used for injection follows the total-production curve very closely and reflects the fact that this gas is that portion of the total which is in excess of total fuel requirements.

The fuel-gas curve shows that requirements are mounting each year. The reasons for the increased fuel requirements are that since 1941 drilling operations have been greatly expanded and continued to expand until the beginning of 1947; also the quantity of fuel delivered to the refinery is nearly three times as great at present as it was in 1937, and the amount of gas delivered to manufacturing facilities on the property has increased considerably during the last 3 years. Most of the drilling operations are carried on with steam rigs. Considerable quantities of gas are being used for baking bricks to supply an extensive construction program that is currently in progress.

The shrinkage curve shows a low in 1939 and 1940 and a steadily increased volume lost to shrinkage until 1945 at which time the curve again declined. This reflects the fact that during 1941 to 1945 Rio Bravo and Llano pools were in the stage of flush production. During this period these pools contributed 30 per cent of the total production of the field at low gas-oil ratios and the gas from these pools was exceedingly rich in liquid content.

The curve showing waste gas is essentially flat except for 1945 and 1946 at which time gas production slightly exceeded plant capacity in some areas. Table 3 shows the volumes of residue gas delivered to fuel and injection for 1937 to 1947.

TABLE 3—DISTRIBUTION OF RESIDUE GAS

Year—	M.c.f. fuel gas	M.c.f. injection gas	Total residue
1947*	7,900,000	7,500,000	15,400,000
1946	7,474,122	7,524,483	14,998,605
1945	6,787,957	9,039,729	15,827,686
1944	6,050,109	8,570,595	14,620,704
1943	5,818,620	6,598,574	12,417,194
1942	5,508,406	4,827,296	10,335,704
1941	4,899,499	5,242,907	10,142,406
1940	5,150,142	6,902,493	12,052,635
1939	5,350,339	7,758,706	13,109,045
1938	4,966,763	7,865,356	12,832,119
1937	4,325,495	9,190,177	13,515,672

*Volumes for 1947 estimated.

The major portion of the liquid products of extraction is delivered to the refinery. Both propane and butane are bottled and sold on local markets. Butane in excess of the market demand has been used for injection along with residue gas and also has been mixed with crude for enrichment.

Pressure Maintenance

Pressure maintenance has been the method established for operating four pools on the Estate, namely, Mile Six, Section 16, Rio Bravo, and Llano. All are pools producing from the Parinas sand, having good massive sand developments with considerable structural relief and each with an original gas cap comprising approximately 8 to 18 per cent of the reservoir volume.

Mile Six and Section 16 pools are essentially steeply dipping monoclines limited on the west by a fault of major displacement and down structure on the east by edge water. These two pools are similar in most respects and are separated by an east-west fault of approximately 1,000 ft. displacement which intersects the confining fault on the west which is common to both.

Rio Bravo pool is situated on the plunging nose of an uplift and produces from both flanks of a fault extending through the center of the pool. Llano pool is a group of fault blocks lying against the upthrown face of a fault of major displacement.

All of the four pools have been operated by pressure maintenance since the early stages of their development and have contributed approximately 23 per cent of the cumulative production of the estate. Pressure maintenance has permitted the major portion or in excess of 95 per cent of the oil produced from these pools to date to be obtained by natural flow. In the case of each of these pools it is estimated that in excess of 90 per cent of the recoverable oil will be obtained by natural flow if the pressure-maintenance operations are continued to their economic limit. This single factor has been of tremendous value in holding the lift costs to a minimum. In addition the recoverable amount of oil from these pools will have been increased threefold by the application of pressure maintenance.

The following brief discussions of each of the four pools are intended to point out similarities as well as differences which have presented themselves as problems during the operations. It is most interesting to note by observing the curves, Figs. 4, 6, and 8, that the major portion of the oil, an estimated 65 per cent of the ultimate recovery, has been recovered from these pools and can be recovered from similar pools in a period of from 5 to 6 years.

Mile Six pool.—Mile Six pool was discovered by cable-tool drilling in 1927, which continued until 1931. These early wells for the most part suspended drilling operations after penetrating the sand for only a short distance. Rotary equipment was brought in early during 1934, which permitted the wells to be carried down approximately to the water level. The development of the pool was virtually completed during the years 1934-37 with the new wells bottomed and the old wells deepened to depths just short of the water level, at approximately 2,700 ft. All completions were made with the oil string set at the top of the sand and a perforated liner set through the producing formation, which had a maximum development of 650 ft.

Further development was carried out during 1939-1947 with two inside locations, three edge wells, and several work-over and deepening projects completed. The pool, which covers 325 surface acres, was developed by drilling 51 wells of which 45 were producers, drilled on a 7.4-acre staggered spacing program.

Production did not actually commence until late 1933 at which time only 385,000 bbl. had been withdrawn from the reservoir and at this time gas injection and pressure maintenance were started. The Mile Six development has been an outstanding operation in many respects and especially in view of the fact that petroleum engineering was comparatively new at that time and reservoir engineering as such had not yet become established. At the very beginning of the operation the limits of the pool were well outlined, and within the reservoir the gas-oil and oil-water contacts were established and

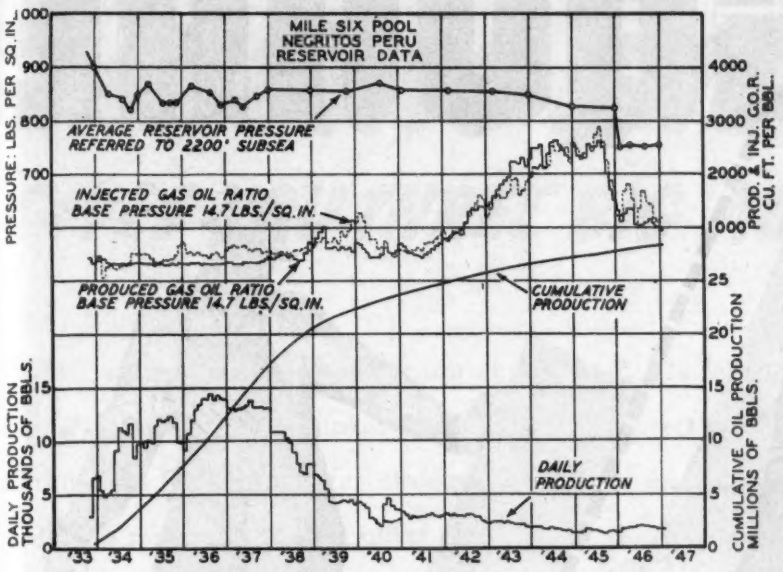


Fig. 4

estimates of gas in solution in the reservoir oil were made with the use of improvised equipment.

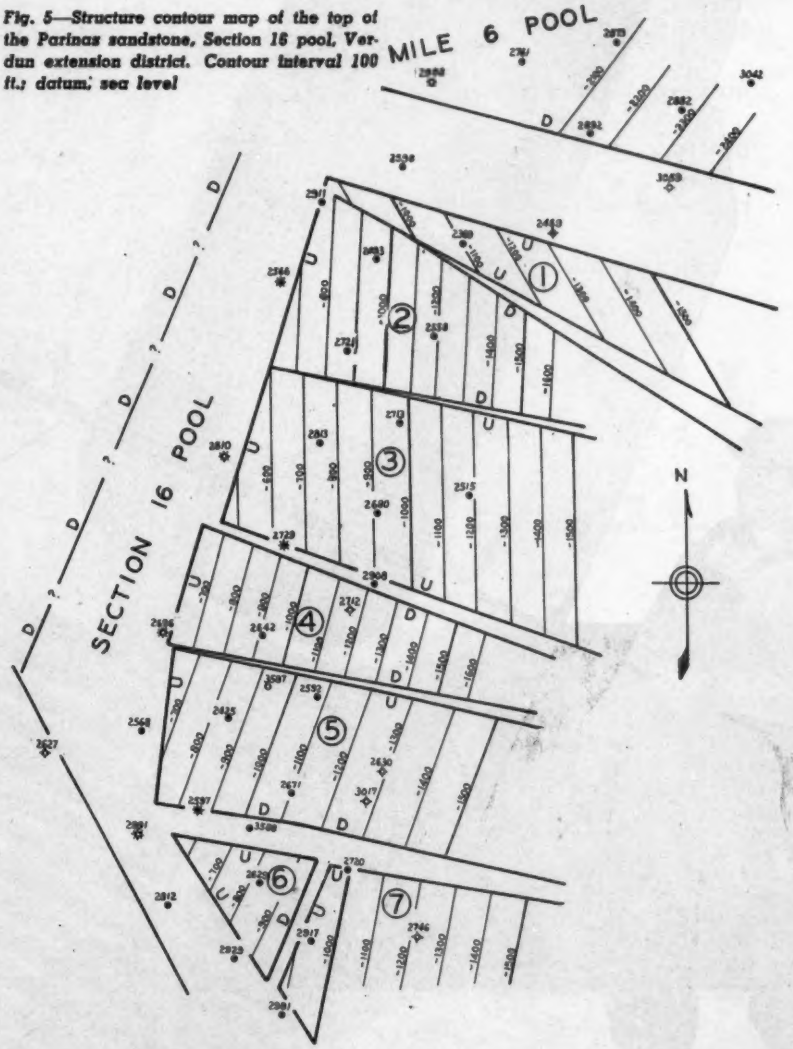
Reference to Fig. 4 shows that reservoir pressures remained essentially constant from 1934 until 1946 and that due to exceptional structural and reservoir conditions (both due to nature) excellent control of the operation was maintained. The pool is an example of gas-cap drive, with the gas cap expanded, the pressure maintained and water entrance into the oil zone deferred by injection of residue gas into the gas cap. This was aided by a high degree of gravitational segregation which is permitted by high permeabilities, high-gravity crude, and favorable structure. The pressure curve is also an indication of the volumetric balance maintained by the injected gas which has equaled volumetric withdrawals for practically the entire life of the operation.

In the latter stages of the initial development the gas oil ratio of the pool was increasing as might be expected. However, by the later development in 1946 which was previously mentioned, the gas-oil ratio was considerably reduced by completing wells (new and workovers) with selective gun perforations in the remaining oil-saturated section of the reservoir. An interesting phenomenon which has been checked and verified numerous times is the fact that with the expansion of the gas cap and gas-oil contact has been lowered uniformly and has maintained essentially a plane surface throughout the reservoir during the entire productive history of the pool. This condition still exists and reflects the high permeability of the sand and the part played by gravity drainage in the fluid movements.

In January 1946 a reservoir pressure drop of 75 lb. occurred as a result of a blowout at well 2281. The well blew wild for 7 days and discharged from the reservoir an estimated 1,450 billion cubic feet of gas and 7,000 bbl. of oil. It was observed at the time that a cross fault through the reservoir prevented communication of fluids through the fault zone and separated the pool into two portions which have since been labeled the north and south ends. The southern portion comprises 75 per cent of the reservoir on both an areal and sand-volume basis. However, the south end has produced 80 per cent of the accumulated production from the pool. The north end showed no pressure drop while the south end dropped from 827 to 729 lb.

Interesting phenomena which occurred were: the immediate increase of production from several wells which indicated that new drainage patterns had been established or that the rapid movement of the fluids had increased the saturation around these bore holes; that some edge wells showed a rapid and large increase in water production which diminished with equal rapidity after the wild

Fig. 5—Structure contour map of the top of the Parinas sandstone, Section 16 pool, Verdun extension district. Contour interval 100 ft.; datum, sea level



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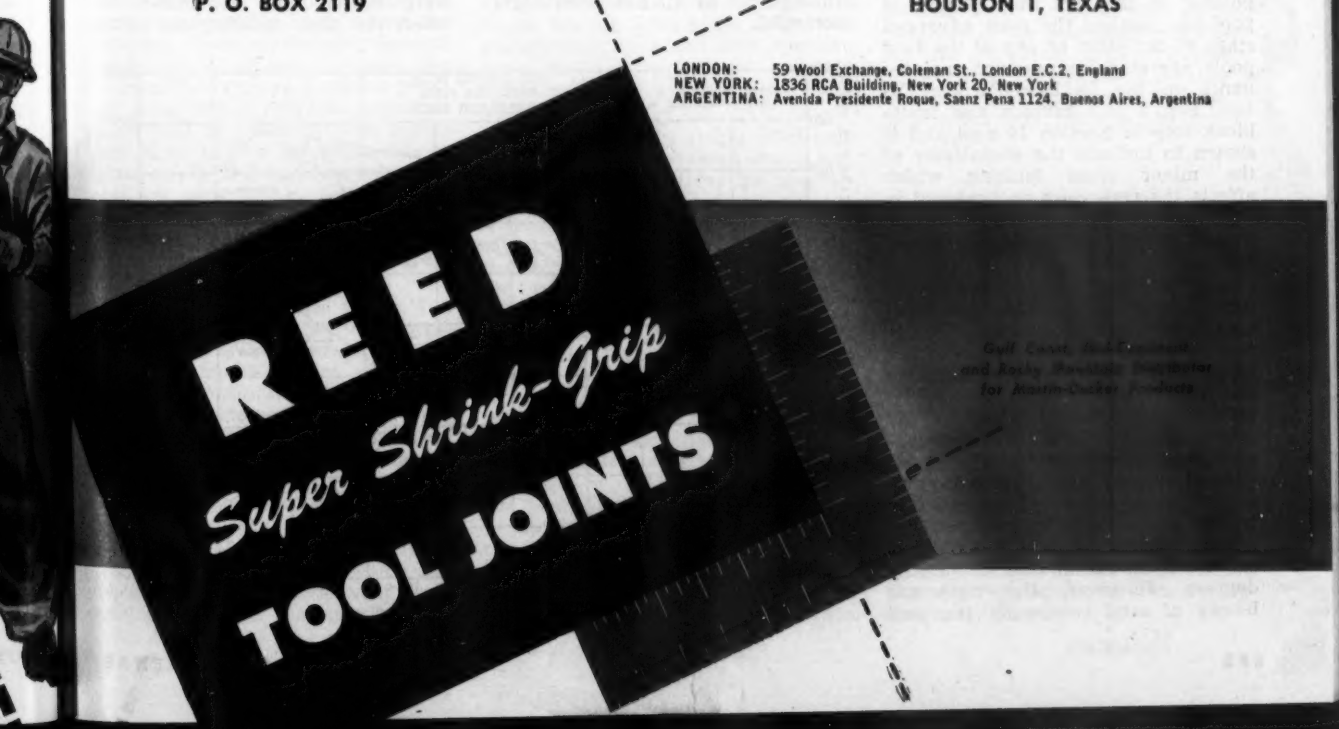

well was capped; that the water and oil levels in the pool remained essentially unaltered at 2,395 and 2,440 ft. subsea respectively.

Following the blowout the pressure in the north end of the pool was permitted to decline while the pressure in the south end was built up until they equalized, which occurred at 760 lb. No undue detrimental effects other than the loss of gas and oil and the pressure reduction in the reservoir were observed.

Section 16 pool.—Section 16 pool which is located just south of Mile Six pool was discovered in 1929 and has had a development almost identical to that of Mile Six and chronologically the operation of Section 16 pool parallels that of Mile Six very closely. The greatest contrast between the two is that Section 16 is about one half the size of Mile Six in area and three-quarters the size in reservoir volume (54,000 and 42,000 acre-ft. respectively) and is producing from a depth about one-half that of Mile Six pool, or 1,200 ft. as compared to 2,500 ft.

The oil is identical, the percentage of reservoir volume originally occupied by gas cap in Section 16 was larger, of the order of 18 per cent and 8 per cent for Mile Six, porosities are lower, 20 per cent as compared to 25 per cent, although permeabilities are higher, 1,300 millidarcys as compared to 1,000 millidarcys, and the gas originially in solution in the reservoir oil of the two pools was proportional to the depth and pressure at which the accumulations were encountered. It is estimated that ultimate recoveries for Section 16 pool will probably be less than one half that of Mile Six pool.

Recompletion of wells in Section 16 pool during 1944 and 1945 were only moderately successful and pointed to the fact that Section 16 pool has reached the most advanced stage of depletion of any of the four pools operated by pressure maintenance on the La Brea-Parinas Estate. Fig. 5 is a contour and fault-block map of Section 16 pool and is shown to indicate the complexity of the minor cross faulting which affects the reservoirs encountered in the Parinas sand. Fig. 6 shows curves depicting the producing history of Section 16 pool.

Rio Bravo pool producing from the Parinas sand was virtually discovered by two wells drilling simultaneously and on opposite flanks of the structure. Initial subsurface pressures in the two wells differed by 40 lb. referred to a common datum and led to the conclusion that they were separate reservoirs. Subsequently, development showed that they were separate reservoirs and that the structure of Rio Bravo pool was composed of a large number of small fault blocks isolated from one another to varying degrees. However, the numerous blocks of sand composing the pool

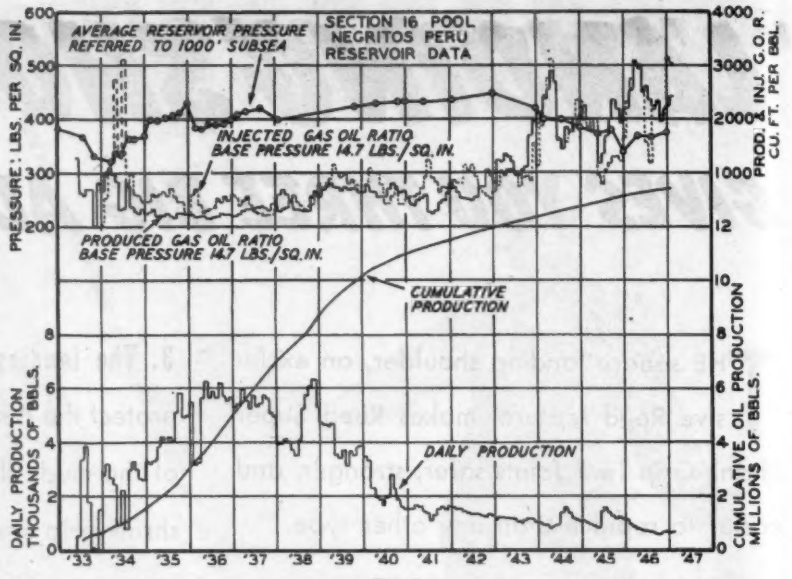
AVERAGE RESERVOIR PRESSURE REFERRED TO 1000' SUBSEA
SECTION 16 POOL NEGRITOS PERU RESERVOIR DATA
INJECTED GAS OIL RATIO BASE PRESSURE 14.7 LBS./SQ.IN.
PRODUCED GAS OIL RATIO BASE PRESSURE 14.7 LBS./SQ.IN.
CUMULATIVE PRODUCTION
DAILY PRODUCTION
PRESSURE: LBS. PER SQ. IN.
PROD. & INJ. G.O.R. CU. FT. PER BBL.
DAILY PRODUCTION THOUSANDS OF BBLS.
CUMULATIVE OIL PRODUCTION MILLIONS OF BBLS.
'33 '34 '35 '36 '37 '38 '39 '40 '41 '42 '43 '44 '45 '46 '47

Fig. 6

have been operated as a unit by pressure maintenance.

In contrast to other pools on the estate which have been operated by pressure maintenance, Rio Bravo is perhaps more complexly faulted and has required more injection wells to effect a stabilized pressure condition throughout the pool. Other complicating conditions are : (1) average permeability is lower in Rio Bravo than other areas having more massive development of Parinas sand, (2) the sediments in the well bores contain more shale breaks and more of the section is sandy shale and hard tight sand than those encountered in the more massive developments penetrated in some of the other reservoirs. Consequently, proper control of the reservoir has been rather difficult although all in all has been highly successful.

There were 80 wells drilled on a 7.2-acre staggered spacing pattern to define the structure. Of these wells 60 are within the effective limits of the pressure-maintenance project, 10 were dry holes, and 10 are edge wells outside the limits of the main operation. The average depth of the 60 wells is 2,000 ft. and with few exceptions were completed with blank casing cemented through the producing section and selectively gun perforated. Formation thickness varies from 50 to 350 ft.

The average initial subsurface pressure, as shown by Fig. 7, was 900 lb. at a common datum plane. An average well produced initially 250 bbl. per day at 350 gas-oil ratio, flowing through a ¼-in. bean. Gas injection and pressure maintenance were initiated in September 1940 when the first withdrawals of any

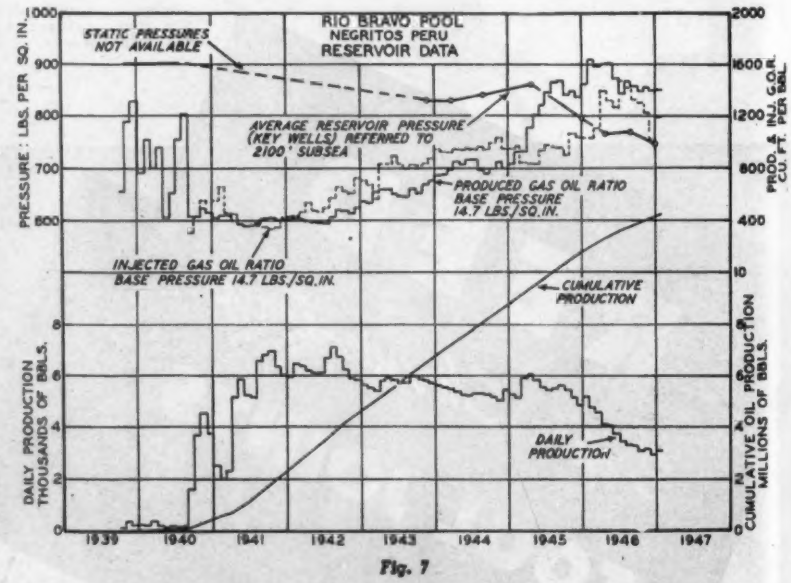
STATIC PRESSURES NOT AVAILABLE
RIO BRAVO POOL NEGRITOS PERU RESERVOIR DATA
AVERAGE RESERVOIR PRESSURE (KEY WELLS) REFERRED TO 2100' SUBSEA
PRODUCED GAS OIL RATIO BASE PRESSURE 14.7 LBS./SQ.IN.
INJECTED GAS OIL RATIO BASE PRESSURE 14.7 LBS./SQ.IN.
CUMULATIVE PRODUCTION
DAILY PRODUCTION
PRESSURE: LBS. PER SQ. IN.
PROD. & INJ. G.O.R. CU. FT. PER BBL.
DAILY PRODUCTION THOUSANDS OF BBLS.
CUMULATIVE OIL PRODUCTION MILLIONS OF BBLS.
1939 1940 1941 1942 1943 1944 1945 1946 1947

Fig. 7

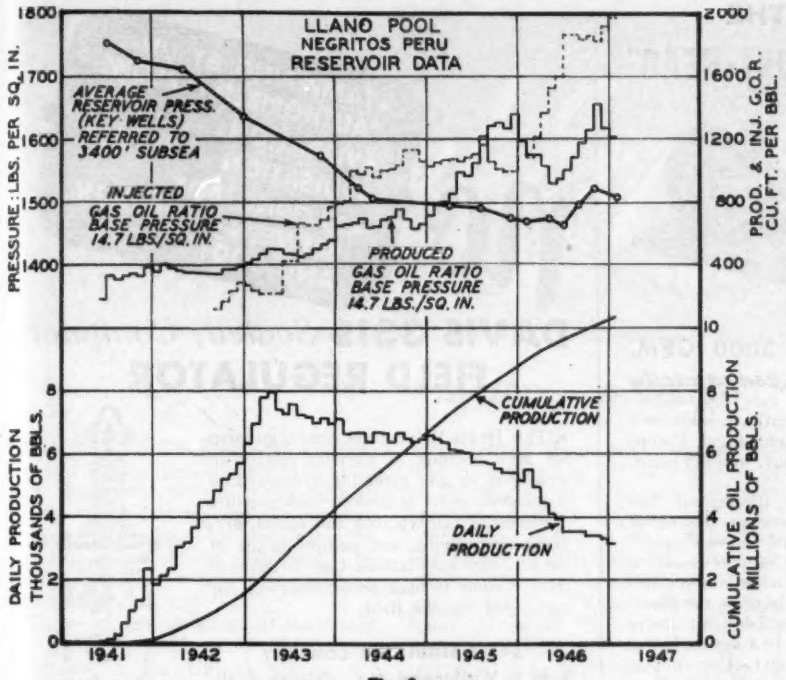

Fig. 8

significance were made from the reservoir.

During 1941 it became evident that low-pressure areas existed within the pool and that gas injected on the crests of the structure in the gas cap would not in all cases be effective in these areas. Efforts were made, although not entirely successful, to overcome this condition by injecting gas in down-structure wells within the low-pressure areas and thus more widely distribute the injected gas.

During the war years it was necessary to exceed the MER of the pool to meet crude-oil commitments. This led to the more rapid depletion of the more permeable strata within the formation which consequently became largely gas saturated and gave rise to a condition requiring greater pressure differentials from the reservoir to the well in order to cause movement of oil in the less permeable or tighter sands. This problem was combated by recompleting several wells either by squeeze cementing or with packers to isolate selected strata for production with additional gun perforations when required.

With further reference to Fig. 7 it may be seen that the declining pressure, which is an average for the whole pool and does not show that some areas within the pool were actually maintained at essentially original conditions, was accompanied by a rising gas-oil ratio. It is felt that the declining pressure was only a contributing factor and that the increasing gas-oil ratio was largely a reflection of the permeability.

Llano pool.—Llano pool which was discovered in 1941 underwent rapid development with the completion of 24 wells drilled on a 10-acre staggered spacing program and covered approximately 240 surface acres. The average depth of the sand is 3,500 ft., the initial reservoir pressure was 1,750 lb., and the average initial production of the wells was 425 bbl. per day at 400 cu. ft. gas-oil ratio through a ¼-in. choke.

Gas injection was not initiated until 1,000,000 bbl. had been withdrawn and a volumetric balance between production and injected gas was not attained until in excess of 3,000,000 bbl. of crude had been withdrawn and the pressure decline was not arrested until 5,500,000 bbl. had been produced. During these years, 1941-1943, gas injection to Llano pool was delayed awaiting equipment and the construction of facilities for handling gas at 1,500 to 2,000 lb.

During the early stages of development it was discovered that probably due to faulting and the position of the highly tilted fault blocks within the pool, injection to the gas cap would not be sufficient for maintaining the pressure throughout the reservoir. Consequently additional injection wells were selected and additional gun perforations made in various zones in several of the wells to permit better communication throughout. Subsequently, it has been necessary to utilize packers to some extent for the isolation of producing zones to maintain as high as possible the efficient rate of production from the pool, and to avoid an excessive production of gas from either the gas cap or from the more highly permeable strata that may have reached a high degree of depletion relative to the tighter or less permeable strata.

Since adequate injection-gas and handling facilities have become available with the installation of a new gasoline plant in the general area of Llano pool, the reservoir pressure has increased and is continuing to increase although this is not indicated by the last plotted point of the pressure curve, Fig. 8.

Summary

It is estimated that 330 billion cubic feet of gas has been produced from La Brea-Parinas Estate in northern Peru. Eighty per cent of this volume has been produced since 1927 and has been utilized with waste held to approximately 2½ per cent. Thirty-nine per cent of the residue gas has been injected into the Parinas sand for pressure-maintenance and repressuring operations. The introduction of gun-perforating methods for well completions materially aided in the efficient utilization of reservoir energy by obtaining the maximum benefit from injected gas.

Geological conditions have created many problems in the pressure-maintained reservoirs but have been overcome by proper distribution of injection wells and recompletion of producing wells. The use of injection gas for pressure maintenance had increased the recovery three fold from four pools which have contributed 23 per cent of the total accumulated production from the estate. By operating Parinas sand pools under pressure maintenance, it is possible to produc 95 per cent of the ultimate yield by natural flow and recover 65 per cent of the ultimate recovery within 5 to 6 years after complete devlopment.

Acknowledgments

Although the text of this paper is original with the author, the illustrations were prepared by various members of the petroleum engineering and geological staffs of International Petroleum Co. Most notable is the fault-block diagram of Section 16 pool which was prepared by Dr. R. W. Landes.

Diesel-Powered Tanker Uses Low-Grade Fuel Oil

How modifications in the high-powered diesel engines of the 12,000-ton motorship Auricula of the Shell Anglo-Saxon tanker fleet have enabled the vessel to operate for 12 months or ordinary boiler fuel oil, was described last week by John Lamb, technical manager of Shell, at a meeting of the Institute of Marine Engineers in London.

The Auricula has undergone nearly 100,000 miles of testing low-grade fuel oil and according to officials has saved between $12,000 and $20,000. The ship was equipped with a 4,000-hp. installation.

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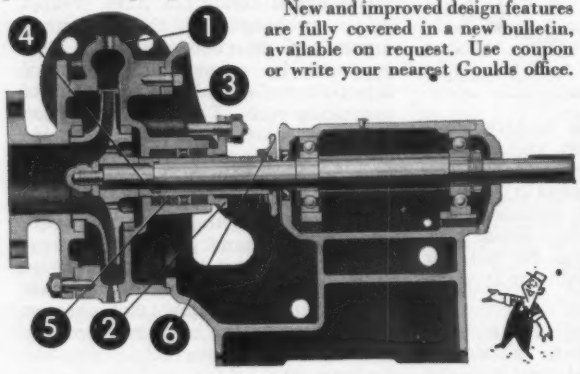

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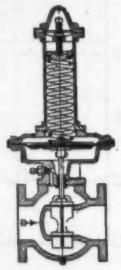

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..Present Export Boom

ON OIL EQUIPMENT SHOULD CONTINUE FOR SEVERAL YEARS...

by Henry D. Ralph

THE demand for American petroleum equipment abroad is greater now than ever before in the history of the oil industry, and the present export boom should continue for several years unless hampered by conditions over which the industry has no control.

These are the shortage of materials, particularly steel, and fabricating facilities in the United States; the dollar shortage of many countries needing American equipment; and the program of the U. S. Government for dealing with these problems, that is, the so-called Marshall plan and its ramifications.

During the first half of 1947 the exports of petroleum equipment were roughly equal to those of the full year 1946 and generally far above those of 1938, the last full prewar year.

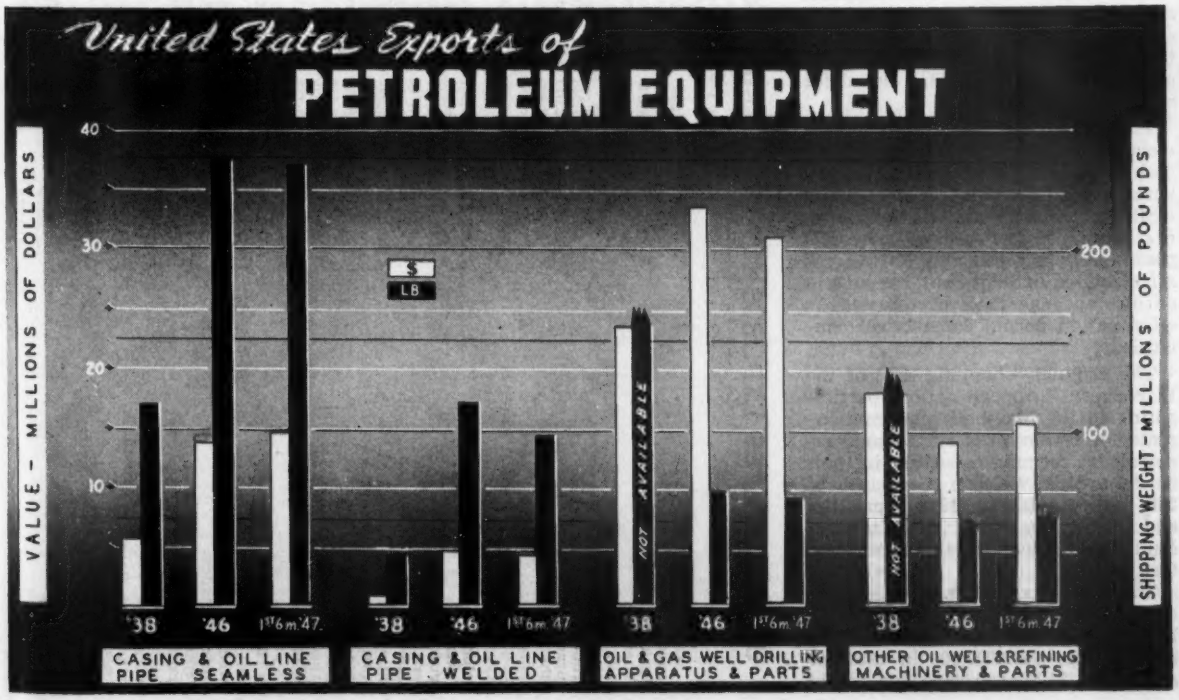
Much of this is due to war's aftermath and this postwar "hump" in equipment exports is not entirely over, though most exporters believe that it is tapering off and that most of the major rehabilitation work is nearing completion.

But the demand for American equipment is still huge in every oil area of the world, and it will be so long as the world's demand for petroleum products continues to grow. And the United States is looked to universally as the source of most of it. Not only is American equipment preferred by most operators of all nationalities, but also this country is virtually the only place in the world where petroleum equipment can be obtained. British manufacturers are making a serious effort to get back into the world market on a large scale, encouraged by their government's dire need for exports, but England is so short of steel that her manufacturers can supply only a portion of the oil-equipment needs of her own empire. France has produced some of the equipment for postwar rehabilitation of her own fields and refineries but is not now a factor in the export trade, and some supplies are available in limited quantities from a few other European sources.

So, by and large, American oil-equipment manufacturers have a huge and expanding world market with little effective competition.

But filling this market presents many practical problems. American manufacturers must be paid in American dollars, and dollars are what almost every foreign country lacks. To conserve their dollars and use them only for the most essential imports, many foreign governments are employing exchange controls and trade restrictions of various types. Even where an oil company has the dollar profits to pay for the American equipment it needs, these government restrictions often prevent it from making the desired purchases.

The seriousness of this dollar short-



age is a matter of opinion. Some equipment exporters fear that their markets will shrink as foreign governments clamp down on the dollars which may be spent by their oil operators. Others take the view that most countries, while prohibiting imports of luxury items, will see to it that dollars are made available for whatever equipment is needed to increase their output of crude or petroleum products. This view is rather widely shared among U. S. Government officials familiar with foreign trade; they point out that the main objective of exchange controls is to channel dollars into capital goods which will increase output of commodities needed for internal consumption or for export or to reduce imports of finished products, and that petroleum equipment most certainly comes in this category.

Another factor is that petroleum projects are in the nature of self-liquidating investments and frequently may be financed by commercial loans to be paid off out of future earnings. Thus the dollar stringency need not curtail the sale of petroleum equipment for projects which promise in a short time to make more dollars available to the countries where they are placed in operation.

Biggest Question Mark

The biggest question mark involving export of oil equipment is our Government's economic program which has come to be known as the Marshall plan. This will operate in two ways: (1) Provide dollars for rehabilitation of the economies of certain nations and thus permit them to buy more from the United States; (2) channel exports to prevent excessive drain on our own supplies, direct supplies to those countries selected for aid, and make sure that the dollars and supplies are so used as to make the recipient countries self-supporting.

Thus the Marshall plan and the measures contemplated to implement and supplement it will stimulate exports for some articles to some areas while reducing others. At this stage of the plan's formulation it is impossible to predict exactly how it will affect oil equipment, but its general outline and the facts of the world's oil situation permit some broad conclusions.

The original "shopping list" of the 16 Western European nations participating in the Marshall plan contemplated a 4-year program to increase petroleum refining capacities in their borders, plus Western Germany, to 250 per cent of the 1938 capacities, and also expansion of indigenous crude production and of distribution facilities.

This program contemplated imports of $449,000,000 of oil equipment in 1948, $452,000,000 in 1949, $442,000,000 in 1950, and $472,000,000 in 1951, or a total of $1,815,000,000. This would

UNITED STATES EXPORTS OF PETROLEUM EQUIPMENT BY DOLLAR VALUE AND BY COUNTRY OF DESTINATION*

	Casing and line pipe (seamless)			Casing and line pipe (welded)			Drilling equipment			Other equipment incl. refining		
			First half			First half			First half			First half
Country—	1938	1946	1947	1938	1946	1947	1938	1946	1947	1838	1946	1947
Canada	452,568	811,860	474,179	29,556	147,726	153,495	1,364,346	1,229,529	940,638	365,250	623,224	544,113
Mexico	59,346	414,838	535,758	13,683	204,679	1,689,157	122,682	875,941	728,583	92,756	647,697	246,684
Bahamas	.....	103,667	55,326	.....	16,133	.....	.....	6,751	45,238	.....	600,449	43,768
Cuba	37,430	77,105	59,389	5,514	63,838	14,584	289,666	557,986	100,049	43,411	121,715	148,142
Jamaica	2,473	.....	1,970	.....	.....	454	8,370	125,647	.....	223	491	679
Trinidad	151,942	267,548	328,167	2,232	.....	2,007	2,200,397	342,527	360,863	525,298	145,430	143,855
Curacao (N.W.I.)	301,945	43,917	26,303	747	1,406	93,739	104,864	1,686	13,172	5,233,583	124,645	105,989
Other	4,048	92,465	147,179	4,943	46,183	40,307	22,668	104,178	224,929	8,871	31,504	45,806
Total North and Central America	1,009,752	1,811,400	1,628,271	56,675	479,965	1,993,843	4,092,993	3,244,245	2,413,472	6,269,392	2,295,155	1,279,036
Colombia	1,010,629	1,533,572	1,157,037	415,180	328,396	395,503	3,110,976	3,726,260	2,489,781	346,371	1,206,054	334,458
Venezuela	1,985,627	5,596,609	5,938,428	377,591	1,677,353	1,547,199	5,959,783	12,025,805	10,815,983	933,078	3,998,606	2,646,374
Ecuador	21,579	191,380	146,076	26,932	8,796	.....	142,454	667,363	322,130	22,479	73,021	38,234
Peru	51,682	984,652	390,393	33,835	16,210	.....	329,020	1,259,871	723,342	155,539	430,803	40,748
Bolivia	1,385	9,324	22,590	.....	3,123	82,125	6,945	135,357	35,977	965	7,843	3,105
Chile	173	117,279	156,844	.....	99,402	7,061	3,263	425,187	132,356	570	6,547	192,864
Brazil	7,543	226,534	124,641	2,395	17,786	45,732	17,955	692,516	163,333	26,108	113,255	116,233
Paraguay	.....	45,659	30,753	.....	.....	1,053	670	200,351	81,290	.....	16,056	16,179
Uruguay	5,674	3,118	.....	.....	.....	.....	15,212	4,703	18,756	67,780	11,384	1,480
Argentina	254,093	307,339	431,773	5,441	8,198	17,695	958,966	457,758	1,397,223	247,745	168,630	880,933
Other	.....	3,272	3,569	.....	11,222	.....	561	2,546	1,739	316	3,685	968
Total South America	3,338,385	9,018,738	8,402,104	861,874	2,170,488	2,095,768	10,545,805	19,597,717	16,181,912	1,800,951	6,035,884	4,271,566
Sweden	.....	.....	64,033	.....	.....	.....	28	915	1,696	49	5,993	1,408,613
United Kingdom	37,785	49,607	5,684	1,757	.....	.....	227,395	290,127	46,824	171,069	64,022	31,996
Netherlands	3,422	19,132	33,537	63	.....	.....	50,837	87,579	95,253	83,355	306	98,744
France	23,211	26,531	43,257	.....	.....	22,819	400,621	1,306,468	2,053,671	221,710	332,026	615,508
Czechoslovakia	2,727	.....	.....	.....	.....	.....	148,494	.....	.....	42,569	.....	.....
Switzerland	.....	.....	.....	.....	.....	.....	.....	.....	6,898	231,331	683	6,072
Poland and Danzig	19,696	.....	50,030	.....	.....	.....	50,710	.....	390,279	58,499	14,727	185,491
U.S.S.R. (Russia)	37,210	962,652	1,146,866	.....	1,793,642	47,236	231,331	2,534,011	210,862	350,725	511,165	3,528,674
Yugoslavia	18,558	228	.....	.....	152	.....	115,864	.....	35,994	49,324	.....	.....
Romania	12,133	.....	.....	.....	.....	.....	485,067	.....	.....	362,270	.....	.....
Other	13	34,712	58,828	.....	28,668	25,912	193,005	257,652	116,288	229,534	117,309	102,419
Total Europe	154,755	1,092,862	1,402,235	1,820	1,822,462	95,967	2,003,352	4,466,752	2,957,765	1,800,435	1,046,233	5,977,519

Country—	Casing and line pipe (seamless) 1938	1946	First half 1947	Casing and line pipe (welded) 1938	1946	First half 1947	Drilling equipment 1938	1946	First half 1947	Other equipment incl. refining 1938	1946	First half 1947
Total Europe	154,755	1,092,862	1,402,235	1,820	1,822,462	96,667	2,003,352	4,466,752	2,957,765	1,800,435	1,046,233	5,977,519
Turkey	5,116	5,252	6,621	.....	.....	.....	10,541	318,743	56,737	38,717	66,029	149,540
Syria	132,071	16,285	35,444	.....	.....	.....	218,921	64,165	63,862	38,528	3,589	1,610
Iraq	77,650	19,049	10,379	.....	.....	.....	136,166	56,300	175,194	325,878	1,418	1,598
Iran	177,622	90,069	84,729	5,640	10,648	.....	542,642	442,879	179,090	3,237,566	220,859	72,372
Palestine and Trans-Jordan	16,156	31,598	322,333	.....	70,106	696	2,992	432,103	133,909	345,307	46,328	680
Kuwait	.....	4,400	315,446	.....	.....	.....	.....	71,272	1,543,154	.....	3,889	99,674
Saudi Arabia	96,019	1,141,001	828,339	6,166	235,382	163,443	875,507	1,738,318	820,558	34,375	656,323	363,975
Arabian Peninsula States	.....	114,308	.....	.....	.....	.....	.....	22,337	.....	.....	19,487	.....
Bahrein	.....	23,171	111,480	.....	.....	16,378	.....	207,836	246,358	.....	107,833	143,759
India	.....	156,678	156,022	.....	3,375	70	.....	310,775	851,550	.....	138,347	1,216,288
Burma	115,100	.....	.....	.....	.....	.....	238,973	3,211	97,145	22,996	.....	38,783
British Malaya	102,731	75,611	187,483	111	1,968	95,064	384,992	495,480	340,077	26,636	125,198	84,174
Netherlands Indies	79,509	17,504	843,164	1,833	47,608	124,775	1,999,752	556,067	1,862,806	1,821,531	52,360	649,678
Philippine Islands	18,259	7,357	41,254	984	20,524	3,282	57,034	9,960	351,496	12,350	10,841	32,217
South and Southeast Asia	77,963	.....	.....	16,048	.....	.....	383,192	.....	.....	860,124	.....	.....
China	.....	63,172	21,150	.....	83,635	10,272	.....	25,054	116,341	9,198	1,850,888	45,767
Japan	21,770	.....	.....	.....	.....	.....	12,876	.....	.....	385,119	.....	.....
British India	263,332	.....	.....	.....	.....	.....	401,153	.....	.....	94,270	.....	.....
Australia	34,801	13,515	28,473	4,354	.....	1,954	132,931	31,681	80,817	27,564	35,911	45,193
New Zealand	72,905	.....	2,232	4,071	.....	.....	337,132	55,063	.....	2,354	711	715
Other	6,432	41	6,429	.....	4,655	2,237	48,684	1,524	55,119	23,261	4,537	24,199
Total Asia and Oceania	1,297,436	1,779,011	3,000,978	39,207	477,903	418,171	5,783,488	4,842,808	6,974,213	7,305,774	3,344,548	2,970,222
French Morocco	464	5,549	99	.....	.....	.....	28,160	269,410	427,406	5,811	11,365	613,863
Algeria	.....	2,108	.....	.....	.....	.....	1,775	25,682	73,685	107	6,030	271,147
Tunisia	15,738	193	44,588	.....	.....	89	55,219	90,620	309,327	2,131	30,480	137,178
Egypt	55,659	211,900	109,947	26,776	16,905	75,828	569,669	435,500	800,726	140,378	387,054	77,696
Canary Islands	3,115	270	6,163	.....	567	304	127	.....	.....	89,781	38,115	43,058
French Equatorial Africa	.....	.....	66,120	.....	.....	.....	.....	108,151	213,332	.....	30,640	35,371
Union of South Africa	6,405	3,244	10,228	.....	623	.....	20,406	129,671	41,190	28,337	102,178	14,928
Other	7,908	12,913	15,965	41,565	5,226	1,411	118,436	36,732	41,470	8,154	6,979	9,536
Total Africa	89,289	236,177	253,110	68,341	23,321	77,632	793,794	1,095,766	1,907,136	274,699	612,841	1,202,777
Total world	5,889,617	13,936,188	14,686,698	1,027,917	4,974,139	4,681,081	23,219,432	33,247,288	30,434,498	17,451,251	13,334,661	15,701,120

*For Department of Commerce "Schedule B" commodity classifications 6062—casing and oil line pipe, seamless; 6063—casing and oil line pipe, welded; 7342—petroleum and gas well drilling apparatus and parts; 7349—other petroleum well and refining machinery and parts. Source: U. S. Department of Commerce.

be divided $555,000,000 from the United States and $1,260,000,000 from nondollar sources. Including overseas dependencies of the 16 nations the oil-equipment needs were given as $1,848,000,000, of which the participating countries intended to supply 68 per cent themselves.

The immediate reaction of American Government officials was that these requests were probably optimistic estimates and that they would have to be screened carefully. There was also some doubt as to whether the 16 nations can supply the volume of equipment contemplated from nondollar sources. There was an implication that the program involved obtaining raw steel from the United States to supply European equipment manufacturers, and this raised a policy question which has not yet been determined.

The other aspect of the Marshall plan is the internal controls this Government contemplates to make sure that the exports go to the right places. This, too, has not yet been revealed in detail, but it will include a considerable expansion of the export licensing system and perhaps some degree of allocation of steel and manufacturing facilities within the United States. The general objectives of these controls are to see that the 16 Marshall-plan nations get the materials (and perhaps only those materials) needed to place their economies on a sound basis; prevent exports to uncooperative nations and to areas where they are less needed; maintain necessary exports to friendly nations, such as Western Hemisphere countries, which are not under the Marshall plan but which need American equipment; and leave enough material in the United States to maintain our own economy on a sound basis.

Tubular Goods

The last point will involve considerable political pressure from various directions. Domestic oil producers insist that exports of tubular goods already are excessive and that more should be kept here for their use. In view of the many questions yet unsettled it is obvious that the effect of the Marshall plan on exports of American oil equipment cannot be predicted until details of the plan firm up, and even then it is probable that changes will be made from time to time.

The European-aid requests, for the most part, exclude expenditures which may be made by American oil companies operating within the 16 nations. These companies are expected to expand their facilities by new dollar investments, which would not place a drain on the dollar exchange of the countries in which they operate.

Outside of the Marshall plan area conditions vary. Throughout most of the British Empire and in the sterling

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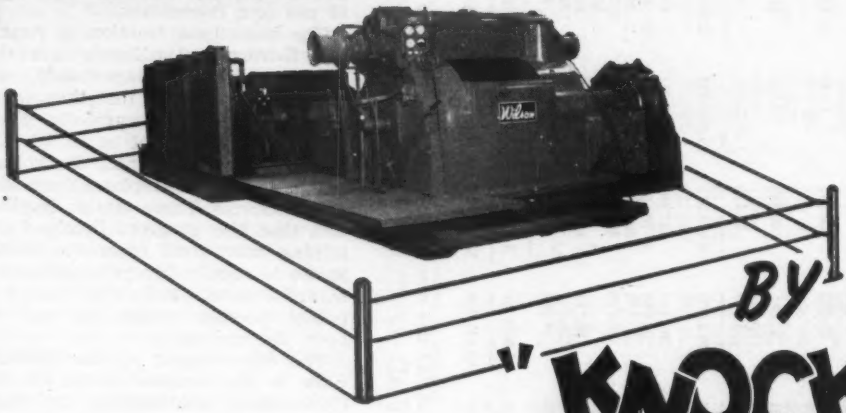

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area there are restrictions on the use of dollars. Oil companies must show that they must have the equipment and that it cannot be obtained from a sterling source before they can secure a permit to buy in the United States. This applies regardless of the nationality of the oil company, but American oil companies operating in the sterling area are rather confident that they can make necessary showings and obtain permits for the equipment they need. British-owned companies operating outside the sterling area are under the same restrictions on the use of their dollars; for example, even in Venezuela, which has no dollar shortage, Shell subsidiaries must buy British equipment unless they can convince the British Government that what they need is unobtainable except in the United States.

South American countries are experiencing dollar shortages in various degrees, and many of them have exchange controls. However, it is probable that they will permit the purchase of American equipment for any project designed to increase their own oil production and reduce the need for using foreign exchange to import petroleum products. American-owned oil companies, of course, can always make new dollar investments in such countries and import the necessary equipment without affecting the exchange situation.

But obtaining dollars and import permits is not the only obstacle to foreign sales of American oil equipment. First, the equipment must be manufactured and then it, at least many items, must clear through the United States export license system.

In general the availability of most items of oil equipment is improving steadily, and deliveries of moderate quantities can be expected in from 1 to 6 months after the order is placed, but other important items may have a factory "lead time" of around a year.

Extension of Law Probable

The present export control law expires February 29, but its extension and revision are contemplated as part of the Marshall plan. Aside from questions of policy, such as which countries are to get how much of what, the export license system is a serious obstacle to exporters at times. Complaints are chronic against the red tape and particularly the delays and uncertainties involved, and exporters not infrequently find that a license has been granted for export of most of the items in a single order but not for one or two important items without which the project cannot be completed.

Summing up the equipment-export outlook, the world demand is huge and will continue so but materials are scarce, many customers have difficulties getting the dollars to make payment, and the Government is setting up a foreign aid and export control program which may be the determining factor in the amount of oil-industry equipment sent abroad during the next few years.

Quite likely the volume of foreign shipments will be considerably below that of recent months which as the accompanying table shows, have been at record heights. This table also reveals changes in the world distribution of American petroleum equipment since the war. It is compiled from official export statistics for the four major categories of oil equipment, and compares 1938, the last full prewar year, with shipments during 1946 and the first 6 months of 1947.

The information in this table has never before been compiled in this form and in such detail. It was prepared for The Oil and Gas Journal by the Department of Commerce as a special feature of this issue.

Rex L. Dawson, division land man at Denver for Carter Oil Co., has resigned to accept a position with Imperial Oil Co. at Calgary, Canada. **John L. Cook** has been transferred from Tulsa to Denver to succeed Dawson.

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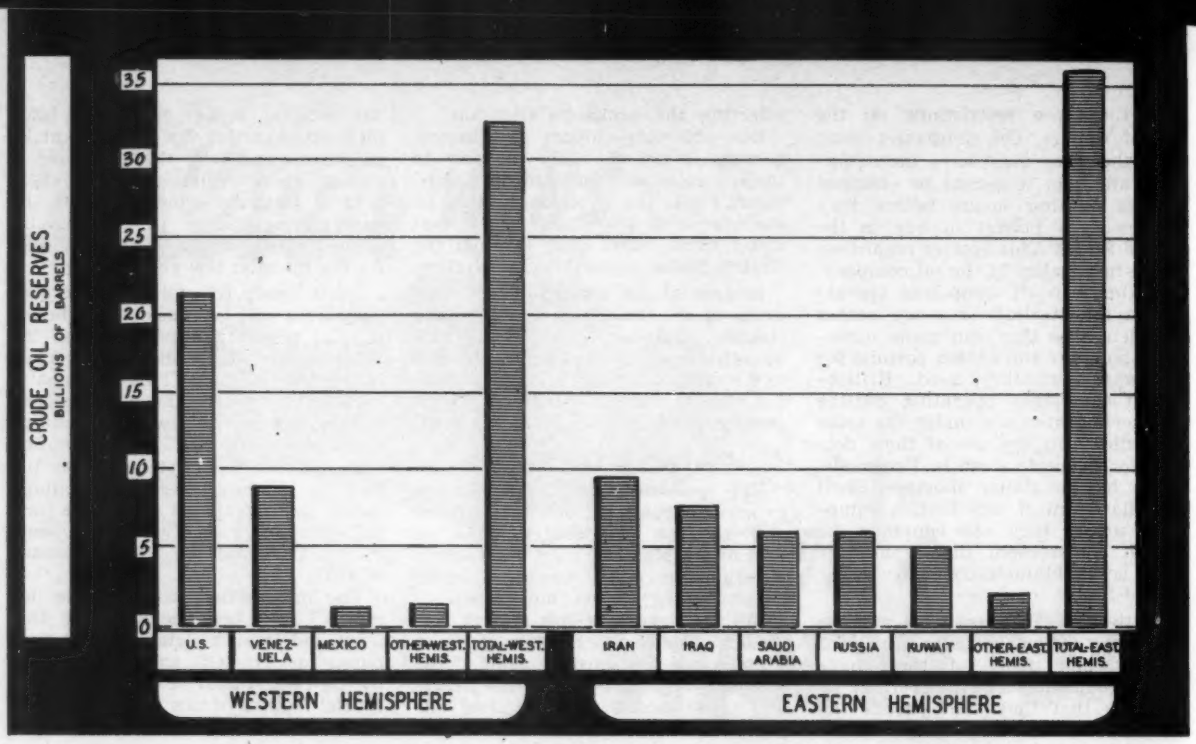

WORLD PROVEN CRUDE-OIL RESERVES

Nearly 70,000,000,000 Barrels

WORLD proven-oil reserves continued to expand over the past year and now total nearly 70 billion barrels. This figure is exclusive of the light-hydrocarbon reserves to which more attention is being given and which in the United States are estimated to total approximately 3½ billion barrels.

In the Western Hemisphere the most important increase in crude-oil reserves has been in Venezuela, now the second largest oil-producing country. While no new major discoveries have been reported in that country in recent months, reports show important additions to reserves in both the western area and also in Eastern Venezuela where operations have expanded rapidly over the past 10 years. In Mexico, largely on a basis of additional development in Poza Rica field, government officials have increased the estimated reserves in that country.

The most important increases in world reserves over the past year have been in the Eastern Hemisphere. The reserve data shown in the accompanying table for the larger producing countries are minimum figures with several observers familiar with oil operations in the eastern part of the world, insisting that the generally accepted estimates, particularly the Middle East, are too low.

It will be noted that the reserve figure for Iraq is now 7½ billion barrels, an increase of 50 per cent over the 5-billion total generally applied to that country over a period of several years. The increase is largely accounted for by the greater reserves credited to Kirkuk field where additional development and operating data since the end of the war have strengthened the field's reserve position.

Kuwait in this report is given a reserve of 5 billion barrels. Other estimates for this country, consisting of Burghan field, run as high as 13 billion barrels. Additional drilling over the past year has confirmed previous geological interpretations as to the large area and the exceptional depth of the producing horizon, resulting in the conclusion by some geologists that Burghan is the largest single oil reserve. New discoveries and extensions have added to the proven reserves of Iran and Saudi Arabia.

PROVEN OIL RESERVES OF WORLD

	Crude-oil reserves (millions of barrels)	Percentage of world total
Western Hemisphere:		
United States*	21,345	31.02
Venezuela	8,500	12.35
Mexico	1,200	1.74
Colombia	500	.73
Argentina	200	.29
Peru	200	.29
Trinidad	200	.29
Canada	125	.18
Ecuador, Bolivia, Brazil, Cuba and Chile	50	.07
Total Western Hemisphere	32,320	46.96
Eastern Hemisphere:		
Iran	9,500	13.80
Iraq	7,500	10.90
Saudi Arabia	6,000	8.72
Russia and Sakhalin	6,000	8.72
Kuwait	5,000	7.26
Netherlands East Indies	800	1.16
Romania	500	.73
Bahrein Island	300	.43
Qatar	250	.36
British Borneo	200	.29
Burma	100	.15
Netherlands New Guinea	100	.15
India, Japan, China	100	.15
Egypt	100	.15
Other Europe	50	.07
Total Eastern Hemisphere	36,500	53.04
Total world	68,820	100.00

*Does not include approximately 3 billion barrels of light hydrocarbons.

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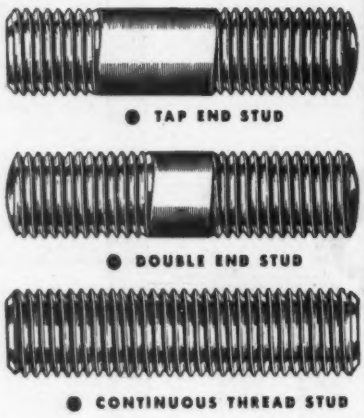

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U. S. Foreign Oil Policy

(Continued from page 227)

dence to consider the possibility, if not the probability, of substantial dependence upon external sources of supply.

This is giving a new orientation and importance to all the other features of our foreign oil policy.

2. Our import policy, publicly stated by many officials, is to bring in just enough foreign oil to meet whatever consumer needs cannot be supplied without exceeding the maximum efficient production of our own fields, but not so much as to hold back development here or prevent the domestic industry from being healthy and vigorous.

Quite frequently, to be sure, some government official or member of Congress will declare that we should shut in our own reserves and hold down production while importing as much foreign oil as possible. This is a familiar theme, but it should not be taken too seriously. It has not been advocated by any responsible person who has taken the trouble to think it through. For one thing, there is no way to do it under our form of government.

The only trouble with this import policy is that no one has been able to propose a workable formula or mechanism for determining just how much foreign oil is enough but not too much at any given time. The literature of foreign oil policy is full of inconclusive discussion on the problem.

Difficulty of Agreement

The price of crude, of course, is what determines the amount of exploration and drilling, the retention of marginal wells, and the extent of secondary-recovery operations. But it would be most difficult to establish an official crude-price figure which would satisfy both domestic operators and consumers. Also, there is no agreement as to the degree to which price is influenced by a given quantity of imports.

The assumption of domestic operators is that foreign oil is cheap and therefore a threat, and so there should be a protective tariff to equalize costs. On the other hand, foreign operators have been advancing figures to show that foreign oil is not cheap, is not likely to flood this country, and that the play of the world's markets will determine how much will come here.

At present our import taxes on crude and petroleum products are low compared with market prices, and the methods by which the rates were fixed initially and later reduced were not related to any oil policy. Nor is there much prospect of an early change in them.

Another possible means of regulating imports is through quotas, but here again there is no legal mechan-

(Continued on page 275)

ism. It has been suggested that, since most of the importations are by large American companies, these companies might agree on voluntary quotas for themselves, but this ignores our antitrust laws. Producers also have requested the State Department to call an industry-wide conference to reach an agreement on the volume of imports, but the only response has been the unofficial observation that in addition to the lack of enforcement means the conflict of interests and argument at such a conference would be an "impossible mess."

For the present and immediate future, then, our import policy will stand without implementation. We are consuming all we can produce and importing as much more as we can get, and these imports are not putting a wet blanket on the search for domestic oil. Natural economic forces, the competitive conditions of the world markets, and the need of exporters for dollar exchange will determine the volume of oil imported.

These same factors are counted on to achieve a corollary of the import policy, namely, the hope that our imports will be chiefly crude and our exports chiefly refined products, so as to maintain a refining capacity in the United States larger than our crude production.

3. Since we must rely, to a degree, on foreign oil, it is a basic feature of our policy that this oil be developed and controlled by American interests.

To this end American operators are being encouraged to seek additional concessions and assisted in developing their present holdings. The State Department gives enthusiastic endorsement to recently announced plans of several companies, including a number of the smaller ones, to enter foreign ventures, and proffers its good offices in making the necessary contacts with foreign governments. It actively assists foreign operators to obtain export licenses for equipment needed for development. Continued and strong diplomatic support can be expected by American oil operators abroad.

This position is actively promoted by the armed services, which, as a matter of fact, have taken the lead in determining our present oil policy. As Com. W. G. Greenman, director of Naval Petroleum Reserves, told the Senate petroleum investigating committee: "Until something displaces petroleum, the armed services have an obligation to take an active part in formulating a national oil policy which will assure the availability of resources ample to meet military requirements and its supporting activities in times of national emergency."

Military's Concern

Having been forced, during the war, to depend on foreign sources for petroleum, the military want to make sure that foreign oil will be available in another emergency, whether or not any of it is imported into the United States in the meantime. And the best way to assure its availability is to have it in the hands of American operators.

Among the reasons for this are: American oil enterprise and technology have been more vigorous and successful than other nationals; American operators keep this Government informed of foreign developments and also are in close touch with American needs; they provide a group of trained men familiar with every part of the world and hence invaluable to the Government in emergency; they maintain a large fleet of tankers, and also distributions, storage, and bunkering facilities, all of great importance in war; and, most important of all, American-controlled companies are more responsive to the needs of the Government. So the military wants not only full development of the world's oil resources, but also a goodly portion of it done by American interests.

Lest this be construed as a policy of imperialism, many military spokesmen add that they mean not an American monopoly of the world's oil but development of a fair share of it by concerns at least partly controlled in the United States. It is recognized

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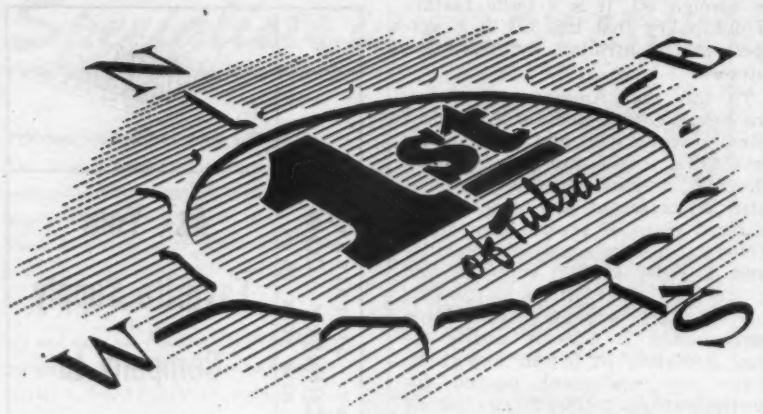

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that our expansion must be kept within reasonable bounds.

For obvious reasons of strategy and logistics, the military want preference given to development of Western Hemisphere reserves. As a corollary of this the Government is encouraging development of Middle East production in the hope that this will supply Europe and thus relieve the drain on Western Hemisphere oil. There is little official sympathy with the argument occasionally raised to the effect that Eastern Hemisphere ventures should be discouraged as likely to embroil the United States in trouble and too remote for use in time of war.

Reason for Support

Another reason for supporting American oil ventures in the Middle East was recently put into words by a high State Department official:

"Middle Eastern oil represents the lifeblood of industry and transport not only of Southern Asia and Africa but also of the Europe of the future. An unfriendly great power in possession of these reserves would be in a position to hamper, if not prevent, the rehabilitation of Western Europe and to retard the economic development of Africa and Southern Asia.

"We are beginning to have a more mature approach to the problem of oil. We are realizing that oil is not merely so much black gold and that a display of interest in the disposition and control of petroleum is not necessarily a manifestation of sinister imperialism. We are learning that at this stage of industrial development oil, like food, is essential to the operation of our very economic life and to the maintenance of what we consider as civilization.

"In view of their economic and strategic importance the Middle East and Southeast Europe are prizes most tempting to an aggressive and ambitious great power. Such a power might well be able, if once in possession of the strategic facilities and economic resources of this area, to decide the destinies of at least three continents and to cast a dark shadow over the whole world for many years to come."

4. It has always been a basic principle of our policy that foreign oil developments are to be undertaken by private enterprise and without government participation.

The only exception to this was the abortive wartime proposal that the Government buy into the Persian Gulf operations. The suggestion has not been renewed and is not likely to be.

But while private capital is expected, and is willing, to assume all the economic risks of foreign operations, it is now well agreed that the Government should provide strong support against political risks. By this is meant changes in the policies of other governments after an oil

operation has been started, such as expropriation, discriminatory treatment, unilateral amendments to contracts and concessions, forced participation in cartel agreements, unfair competition from government monopolies, or excessive taxes or tariffs.

This does not imply that our State Department will assume to dictate the internal affairs of other nations, but simply that it will intercede with strong representations in an earnest attempt to see that American operators are treated according to Anglo-Saxon ideas of fair play.

Now and then there is a suggestion that military protection should also be provided, but as usually stated this means that no more than that our armed forces should be strong enough to be ready to back up our diplomatic policies whenever and wherever that resort might be necessary.

5. American oil companies abroad are free agents, exercising their own business judgment without direction or control by the United States Government.

In return for diplomatic support it is implicit that they conform to American foreign policy and keep the State Department advised on their activities. This is almost always done as a matter of course, and both foreign operators and department officials say that their cooperation is close and cordial, leaving little to be desired on that score.

Role of Government

Without attempting to dictate, the Government often makes suggestions, which are sometimes followed, sometimes not. For example, the department advised an operator in Paraguay that, to avoid the appearance of imperialism, it should reduce the area of its exploratory concession, and this was done; a similar request to an operator in Ethiopia was not followed.

It has been suggested in some Congressional and other quarters that foreign operators should be subject to closer supervision by the State Department, on the theory that they are so large and powerful that they exercise almost sovereign powers in dealing with some of the smaller nations. This idea has not been pressed, and the present system of close consultation is generally considered satisfactory.

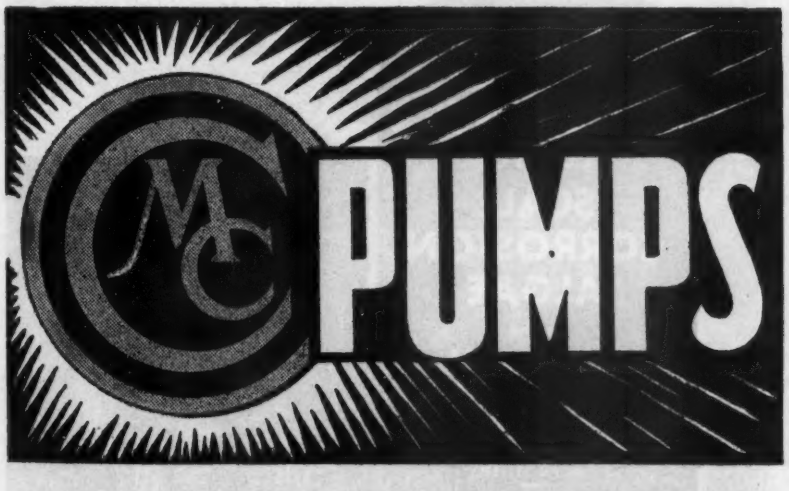
Another suggestion made from time to time is that the terms of all concessions and important contracts be made public, or at least filed with the State Department. Some companies have done this and some have not, but the trend is toward fuller publicity of foreign operations—sometimes through voluntary action, sometimes through Congressional investigation.

6. Fair play is the essence of our foreign policy, and the Government insists that it work both ways. American oil operators can expect strong diplomatic assistance in disputes with other countries provided they have played fairly themselves.

The basic principle is strict observance of contracts, a tenet more carefully observed in Anglo-Saxon areas than in some other parts of the world, but the State Department expects more than that from American operators. They are expected to act as unofficial ambassadors of the American way of life, instilling some of our culture and technology while conforming to the local laws and customs.

Some commentators on foreign policy have stressed the proposal that American companies should be required to improve the economic conditions of the countries in which they operate, such as by educating the natives, operating hospitals, and leaving a goodly portion of their earnings in the country. A generation ago this criticism might have been valid, but under present conditions the companies have to do these things as a matter of operating convenience if not required by the terms of their concessions.

They have to build and maintain roads which are open to the public, water wells, schools, hospitals, and housing for their employes. They hire great numbers of natives and



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train them in various skills. Often they install irrigation or modern farming projects, and build entire communities. In some instances they have gone so far in raising the standard of living in their areas as to embarrass the local government by the contrast with the rest of the country. And as for leaving part of their earnings in the country, present-day concession terms and tax laws see to that without any prodding from the United States Government.

7. The open-door principle has always been a part of our foreign policy, and the Government insists on it in petroleum matters.

If a foreign government prefers to develop its oil resources by itself, that is its own concern and our Government keeps hands off. But if it opens its borders to foreigners, our Government insists that American nationals have an equal opportunity with those of other countries to bid for concessions and establish refining or marketing activities. This does not mean that Americans have to be given what they ask, but simply that they get an equal opportunity to bid or to try to make a go of their business ventures.

Another term used for this principle is most-favored-nation treatment, which means that Americans are entitled to all considerations which a foreign government gives to any other nationals. It is reciprocal, and a company owned in any country observing the open-door policy may operate in the United States on equal terms with American companies.

Discussion of this principle frequently employs such language as "equality of opportunity," and "equal access of all nations to the world's petroleum resources." This has led to much misunderstanding. When such terms were used in connection with the Anglo-American petroleum treaty, for example, some people chose to assume that it meant forcing the have nations to divide up with the have-not nations, or canceling all present concessions and starting over with a new deal.

Nothing of the sort is implied. The terms are simply synonyms for the open-door, nondiscrimination, most-favored-nation treatment, American way of doing business by free competition—fair play and no favorites, and let the best man win.

8. Our government is working constantly to have the international trade in petroleum and its products (and all other commodities) move on a competitive and nondiscriminatory basis.

"Fair Prices"

Sometimes the words "at fair prices" are used, with complicating implications. All that is meant is that competition should set the price and determine the volume and direction of the flow of oil. To accomplish this the world's markets must be free of artificial restraints. This does not mean "free trade," for protective tariffs are not opposed if they are reasonable and fairly applied. A firm stand is taken against the policies of other governments which discriminate against imports of American oil in favor of oil from some other source, or discriminate against American companies attempting to do business there. The Government also opposes, though with indifferent success, all forms of artificial trade barriers such as quotas, marketing restrictions, and cartel agreements.

This cartel problem has not been solved. It is frequently suggested that American corporations should operate abroad just as though our domestic antitrust laws applied, and so should stay out of all arrangements which restrict competition. As a matter of fact, they are under some jeopardy in not so acting, since our antitrust laws are not clear on the matter of foreign activities. But the companies point out that much as they prefer open competition, they are up against the stark necessity of doing business according to the laws and customs of the foreign country or not doing business at all. And where this involves joining a cartel they have to join or get out. No solution to this dilemma has yet been advanced.

9. The final point in our postwar

foreign oil policy is to keep petroleum from being a cause of international friction.

It is perhaps the most important point of all, but it is still the most nebulous. It is based on the theory, as stated in the Anglo-American treaty, that there is enough oil in the world for everybody and that all needs can be met if the principles of equal opportunity and nondiscrimination are observed universally. Therefore there is no need for the United States nor any other nation to pursue an imperialistic policy of gobbling up the world's oil resources, no reason to hoard reserves, and no excuse for any nation threatening war to obtain foreign oil.

How to accomplish this has been the subject of much discussion. The Anglo-American treaty adopts the approach of a purely consultative international petroleum commission which it is hoped many nations will join.

Some suggestions would put the international oil trade under the United Nations or one of its subsidiary organizations in some way, but this finds little favor among most American officials and the idea is considered premature, to say the least.

It is agreed, however, that our foreign oil policy should be based on and be a part of our over-all postwar foreign policy which is aimed toward the maintenance of peace, political stability, and a healthy economic environment throughout the world. A corollary of this general policy is sanctions against "aggressor" or noncooperating nations, as exemplified by our present control of exports of petroleum products.

Petroleum's preeminent importance to the modern industrial world makes it a tremendous potential for either peace or war. Our Government is determined to make it an instrument of peace and economic progress, and toward this end our entire foreign petroleum policy is shaped.

Iran Again Seeking Control Over Bahrein

ONCE again the Iranian Government is asserting its claim to Bahrein Island, an independent sheikdom in the Persian Gulf. Bahrein, which enjoys British protection, produced approximately 25,000 bbl. daily of crude oil this year.

Bahrein Petroleum Co., Ltd., which is jointly owned by Standard Oil Co. of California and The Texas Co., holds an oil concession over 100,000 acres on the island. While reports indicate that production there may fall off in subsequent years, it is thought possible that additional oil-producing structures may be found somewhere along the shoals, reefs, waters, and submerged acreage which the company obtained concession on in 1939.

Bahrein was last under Iranian rule in 1783 and has since been in the possession of the Ataiba Arabs under a British protectorate. As late as 1927 Iran attempted to claim sovereignty, but Britain effectively rejected the claim.

Now a special Iranian Parliamentary Commission has been appointed "to examine the status of Bahrein Island."

Bahrein is possibly of more importance because of the large refinery there than for its indigenous crude oil. Arabian American Oil Co. sends crude to Bahrein from Saudi Arabia via an underwater pipe line. Current daily throughput of the Bahrein refinery is 135,000 bbl.

Contract Reported for Drilling in Argentina

A contract for drilling 40 exploratory oil wells has been signed by Argentina's Yacimientos Petroliferos Fiscales (Government Oil Fields) and Drilling & Exploration Co., Dallas, according to dispatches from Buenos Aires. Cost to the Argentine Government reportedly will approximate $12,500,000.

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QUESTIONS on TECHNOLOGY

by W. L. Nelson

Consulting Engineer

This department was created for the purpose of aiding managers, superintendents, engineers, chemists and all those engaged in various phases of plant operation, as well as those connected with the marketing and utilization of petroleum products. Readers are invited to submit their problems to W. L. Nelson, technical editor. Inquiries must be signed, but only the initials will be printed.

Sulfur in Cracked Products

We are wondering if cracked distillates will contain too much sulfur to permit them to be used along with straightrun distillate fuel oil? Our crude oil contains 0.43 per cent sulfur.—R. C.

The distribution of sulfur in various parts of a crude oil has been studied for California crude oils by Mithoff, MacPherson and Sipos (California Crude Oils, *The Oil and Gas Journal, November 6, 1941, page 81).* They show the sulfur content as a function of boiling point for seven crude oils. They also show the percentage of sulfur in cracked residuum plotted against the percentage of sulfur in the cracked naphtha. Their data in tabular form are shown in Table 1.

TABLE 1—APPROXIMATE SULFUR CONTENT OF CRACKED NAPHTHA

Per cent sulfur in cracked fuel oil	Per cent sulfur in cracked naphtha that contains 85% of cracked gasoline
0.5	0.2
1.0	0.5
1.5	0.77
2.0	1.13
2.5	1.43
3.0	1.75
3.5	2.1

C. R. Wagner (Reactions of Sulfur Compounds During Cracking, *The Oil and Gas Journal, December 2, 1943, page 69)* presents material balances of the sulfur content of cracked products as shown in Table 2. This indicates generally that approximately 5-10 per cent of the original sulfur goes to the cracked gasoline, about 70 per cent to the cracked fuel oil, and 20-25 per cent to the gas. The footnote states that 1.6 per cent of the sulfur goes into the cracked distillate fuel oil. Thus, if 10 per cent of cracked distillate is produced and if the original cracking stock contains 0.7 per cent sulfur, the pounds of sulfur in the cracked distillate fuel oil would be approximately:

$$100 \times 0.007 \times 0.016 = 0.012$$

and the percentage in the 10 lb. of distillate fuel would be:

$$\frac{0.012}{10} \times 100 = 0.12 \text{ per cent}$$

Likewise the percentage of sulfur in 50 lb. of cracked gasoline would be about:

$$100 \times 0.007 \times 0.075 \times \frac{100}{50} = 0.105\%$$

However, these data are so fragmentary that they should not be relied upon for any conclusions except most general ones.

Finally, A. N. Sachanen (Chemical Composition of Synthetic Gasolines, Ref. Nat. Gaso. Mfr., December 1939, page 59) presents the sulfur contents of straightrun and cracked gasolines from the same crude oils. Most generally, the sulfur content of the cracked gasolines is about three times as large as the sulfur content of the straightrun gasolines, but great variations are evident.

TABLE 2—SULFUR DISTRIBUTION AMONG CRACKED PRODUCTS

Feed stock—	Sulfur in feed (per cent)	Yield cracked distillate (per cent)	Percentage of sulfur, based on sulfur on feed, in		
			Cr. dist.	Cr. fuel	Gas
Plant operations:					
1. Illinois crude oil*	0.23	*58	5.5	65.6	27.3
2. Gas oil and recycle	0.44	50	7.9	72.7	19.4
Experimental tests:					
3. Butts from rerunning acid-treated kerosine	0.83	49	18.2	54.4	27.4
4. Refractory recycle stock	0.29	50.3	21.3	77.5	1.2
5. 90 per cent regular feed stock and 10 per cent neutralized acid oil from acid recovery system	0.63	50.5	12.2	42.8	45.0
6. Same as 5, except 70 per cent regular feed stock	0.74	50.3	14.9	40.8	44.3

*Also 6.3 per cent furnace distillate containing 1.6 per cent of the sulfur in the feed stock.

Moth-Balls in Gasoline

I shall very much appreciate hearing about the beneficial or harmful effect of the addition of naphthalene to gasoline as a fuel. Will it have any action on the motor itself?—C. E. B.

Although the use of naphthalene in gasoline has been suggested or referred to for many years, nothing seems to have been reported in the literature. In 1934, however, an Austrian patent (138,202) was issued to A. Korting. This patent mentions good effects obtained by adding naphthalene, biphenyl, or their oxidation products to motor fuel when used in amounts of 4 to 12 g. per gallon. The patent must be consulted for more complete information.

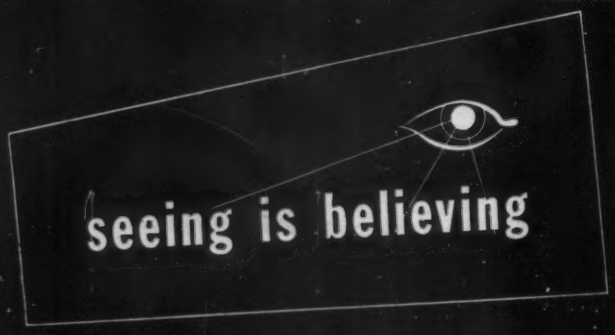
Naphthalene is a double benzene ring hydrocarbon which has the following properties:

Specific gravity, 20/4	1.145
Melting point, °F.	176.9
Boiling point, °F.	423.7
Index of refraction	1.5823
Specific heat at 22.1° C.	0.305
Heat of vaporization, B.t.u./lb.	135
Heat of combustion, B.t.u./lb.	17,350

It is said to be present in certain aromatic or benzenoid crude oils such as some of those from California, and hence would appear in the straightrun gasoline from such oils. It is a solid at room temperature and hence it could not be used in large percentages without increasing the freezing point of the gasoline. Ordinarily the freezing point is not specified except for aircraft fuels.

The blending octane number of naphthalene could be determined by dissolving it in a standard fuel. Its equivalent or blending octane number should be very high, perhaps in excess of 150 by the A.S.T.M. method, but when used in small amounts its effect would probably be scarcely noticeable. Its heating value is somewhat lower than the 20,000 expected in gasoline but since the power developed from a fuel is dependent more on its detonation characteristics than on its heating value, the low heat of combustion may mean little. Its high boiling point might contribute to incomplete combustion, smoke in exhaust, and engine deposits, but in the small amounts contemplated, these effects would probably be negligible.

In the amounts suggested by A. Korting or perhaps up to 50 g. per gallon, naphthalene would probably not cause difficulty in the operation of an engine but the effects of the fuel might also be small. The octane number of the fuel might be increased by one or two units.



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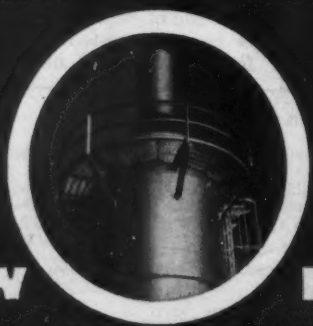

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Equivalent Length in Feet Caused By Various Fittings and Restrictions

(For streamline flow, the friction caused by fittings is usually neglected)

Nominal pipe size (in.)†—	⅜	½	¾	1	1¼	1½	2	2½	3	4	5	6	8	10	12
Gate valve:															
¾ closed	35	40	52	70	90	110	140	165	200	280	350	400	540	700	800
½ closed	9	10	14	17	22	25	33	38	50	65	80	100	130	160	190
¼ closed	2	2	3	3	4	5	7	8	10	13	17	19	26	33	39
Open	...	...	...	...	1	1	1	1	2	2	3	3	4	6	7
Globe valve—open	15	16	22	27	36	43	54	62	82	110	140	170	220	280	330
Angle valve—open	7	8	11	14	18	21	27	32	41	55	70	82	110	140	165
Return bend:															
Closed	3	4	5	6	8	10	13	15	18	23	30	36	47	62	73
Medium radius	2	2	3	3	4	5	7	8	10	13	17	19	26	33	39
Pipe still—square block	...	...	...	...	12	14	20	24	28	38	48	58	...	...	...
Pipe still—streamline	...	...	...	...	6	7	10	12	14	19	24	29	...	...	...
Tee, standard:															
Side outlet	3	3	4	5	7	9	12	14	17	22	28	33	43	55	66
Straight through	1	1	1	2	2	3	4	4	5	7	9	11	14	17	20
½ reduced	1	2	2	3	4	4	5	6	8	11	14	16	20	26	31
¼ reduced	1	1	2	2	3	4	5	5	7	9	12	14	18	22	27
Elbow:															
Standard	1	2	2	3	4	4	5	6	8	11	14	16	20	26	31
Medium sweep	1	1	2	2	3	4	5	5	7	9	12	14	18	22	27
Long sweep	1	1	1	2	2	3	4	4	5	7	9	11	14	17	20
45°	1	1	1	1	2	2	3	3	4	5	6	7	10	13	15
Square	3	3	4	5	7	9	12	14	17	22	28	33	43	55	66
Enlargement, sudden:*															
d/D-¼	1	2	2	3	4	4	5	6	8	11	14	16	20	26	31
d/D-½	1	1	1	2	2	3	4	4	6	7	9	11	15	18	22
d/D-¾	...	...	...	...	1	1	1	1	2	2	3	3	4	6	7
Entrance connection	1	1	1	1	2	2	3	4	5	6	7	9	12	15	18
Contraction, sudden:*															
d/D-¼	1	1	1	1	2	2	3	3	4	5	6	7	10	13	15
d/D-½	1	1	1	1	1	2	2	2	3	4	5	6	6	10	12
d/D-¾	...	...	...	...	1	1	1	1	2	2	3	3	4	6	7
Welded 90° bends:															
R/D-0.5	2	2	3	3	4	5	7	8	10	12	16	19	25	32	38
R/D-1.0	1	1	1	2	2	2	3	3	5	6	7	8	11	14	17
R/D-1.5 or 5.0	...	1	1	1	1	2	2	2	3	4	5	6	8	10	12
R/D-2.0 or 4.0	...	...	1	1	1	1	1	2	2	3	4	4	6	8	10
R/D-3.0	...	...	1	1	1	1	1	2	2	3	4	4	6	7	9

*"d" refers to smaller pipe, "D" refers to larger pipe and "R" refers to radius of bend, all in same units. Use "d" for the pipe size headings at the top of the tabulation. †Except pipe still bends are actual i.d.

No. 176 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

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NATURAL GAS

Gas Allowable Is Set For Gwinville Field

JACKSON, Miss.—The state Oil and Gas Board of Mississippi has entered an order fixing the allowable production of natural gas for Gwinville field of Jeff Davis and Simpson counties.

Under the order, each of the 51 gas wells now producing in Gwinville field is allowed to produce at the rate of 1,365 cu. ft. of gas per acre per day, or 42,315 cu. ft. per acre per month. Most of the wells are assigned an acreage of 320, none exceeding that but several smaller due to the shape of the blocks of land.

The order said:

"The board finds that the Gwinville oil and gas field contains a common source of supply of gas and that the aggregate lawful productive capacity of the wells now drilled and located in the common source of supply of gas is in excess of the present market demand for gas from gas wells located in said common source of supply and that waste will result and public and private interests will not be protected and correlative rights and opportunities of each owner of gas in said common source of supply will not be adjusted unless the board shall allocate, in accordance with said rules for Gwinville field adopted August 11, 1947, and in accordance with law, the market demand for gas from the said field.

"The board further finds that the market demand for gas from Gwinville field for the month of December 26, 1947, to January 25, 1948, both inclusive, is as follows: 5,270,000,000 cu. ft. of gas."

Well owners in the field are as follows: Gulf Refining Co., 22 wells; Humble Oil & Refining Co., 13 wells; S. W. Richardson, 2 wells; Sun Oil Co., 7 wells; Superior Oil Co., 7 wells.

Texas Eastern Will Ask New York Service Permit

WASHINGTON—Texas Eastern Transmission Co. officials have disclosed that they intend in the near future to ask the Federal Power Commission for authority to extend "Big Inch" gas service to the New York market.

The announcement came following a statement by Mayor O'Dwyer of New York supporting the application of Trans-Continental Gas Pipelines Co. for authority to build a $150,000,000 system which would carry natural gas into New York. The application is being opposed by TET.

Natural-Gas Consumption Continues to Increase

Volume of natural-gas sales during the third quarter totaled nearly 522 billion cubic feet, an increase of 12.2 per cent over the second quarter, according to the American Gas Association.

Revenues from the sale of natural gas showed an increase of 14.8 per cent during the period.

For the 12-month period ending September 30, volume sales showed an increase of 14.9 per cent and revenues, 18.2 per cent.

United Gas Corp. Gets Galena Park Franchise

HOUSTON.—United Gas Corp. has received a 10-year franchise to serve consumers in Galena Park, Tex., near Houston.

The service will be in addition to present facilities of Houston Natural Gas Co. in Galena Park. United Gas will furnish gas to various industrial establishments in the area. Rates for United Gas will be the same as those in Houston, and the city of Galena Park will receive 2 per cent of gross sales within the city limits.

Thompson Dramatizes Gas Saving by Conservation

AUSTIN.—E. O. Thompson, chairman of the Texas Railroad Commission, has again emphasized the importance of utilization of flare gas, pointing out that gas has taken on added economic value as a result of development of processes for its conversion to liquid hydrocarbons.

The commission chairman said an automobile traveling 15 miles on a gallon of gasoline could be driven around the world 1,670 times on the motor fuel derived daily in Texas from gas that formerly was wasted.

Texas natural-gas reserves, he said, are now estimated to exceed 160,000,000,000,000 cu. ft. With current production of 2,750,000,000,000 cu. ft. a year, this assures a generation's supply even if no more important discoveries are made, he added.

Three Firms Granted Construction Authority

Home Gas Co., Manufacturers Light & Heat Co., and Cumberland & Allegheny Gas Co. have been granted authorization by the Federal Power Commission to construct additional natural-gas transmission facilities.

Under the permit Home Gas will install two regulator stations in Deer Park Town, New York.

Manufacturers Light & Heat will build facilities to enable it to receive gas from Texas Eastern Transmission Corp. in Chester County, Greene County, Pennsylvania, and will build a 375-hp. compressor unit in its Waynesburg, Pa., station.

Cumberland & Allegheny will construct 7 miles of 6-in. gas line between Terra Alta, W. Va., and Oakland, Md.

Natural Gas Statistics Show Increases for 1946

Operating revenues of natural gas companies subject to Federal Power Commission jurisdiction amounted to $615,000,000 in 1946 and the total number of customers served by the companies increased to 4,040,264 during the year, according to the annual edition of "Statistics of Natural Gas Companies," recently released.

The report contains financial and operating information on 114 gas companies. Sales in 1946 to ultimate consumers amounted to 1,139,798,529,000 cu. ft., and sales to other gas utilities amounted to 1,581,745,611,000 cu. ft.

Natural Gasoline

Rangely Gasoline Plant To Be Ready Next Fall

A new natural gasoline plant scheduled to be built by three companies near Rangely, Colo., next year will produce large quantities of liquid products and provide dry gas for repressuring the Rangely field.

The plant is being built by The California Co., The Texas Co., and Stanolind Oil & Gas Co., but other producers in Rangely field have been invited to participate in the ownership. It is designed to handlde 20 million cu. ft. of gas daily and to produce 25,000 gal. of gasoline, 50,000 gal. of propane, and 16,000 gal. of butane daily. Plans contemplate its eventual enlargement to handle 40 million cu. ft. daily.

Construction contract has been let to Hudson Engineering Co., Houston, which plans to begin work early in the spring and complete the plant by the fall of 1948. Estimated cost is approximately $3,000,000.

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REFINING

New Plant Fractionates Crude in One Operation

COMPLETE fractionation of crude oils and preparation of a variety of special feed stocks in a single operation can be accomplished by the use of a new pilot plant installed by Universal Oil Products Co. in its Riverside Laboratories.

The new unit operates at a crude-oil rate of 1 bbl. an hour and is completely equipped with automatic control devices.

Evaluation of potentialities of the refiner's crude oil is greatly simplified by the new unit and the cost is substantially reduced because the pilot plant can take a relatively small sample of the refiner's own crude oil and prepare samples of feed stock for various process units at a relatively low cost. Previously it often has been necessary to make an expensive full-scale run in the refinery or in several pilot plants to produce the desired feed stock samples.

The pilot plant consists of three sections which can be operated separately or as one integral unit. The first section is a gas-fired crude pipe still and fractionating column. There are side cut strippers in which are carried out ordinary fractionations at atmospheric pressure to produce gasoline, kerosine and light-oil distillates, leaving a residual reduced crude as crude column bottoms.

The second section consists of an electrically heated vacuum furnace and vacuum flash tower which can be used to process either crude column bottoms or extraneous topped crude. A three-stage steam jet vacuum pump and barometric condensers permit operations at pressures substantially below those normally encountered in commercial vacuum flashing operations.

Third section is a superfractionating system of two highly efficient fractionators arranged for series operation, so that narrow boiling heart cuts can be prepared. First of the superfractionators can be operated with the crude column to provide for continuous depropanization or debutanization of straightrun gasoline from the crude oil.

Utility of the unit is demonstrated in a typical operation using the entire unit to prepare feed stocks and finished products. Crude is charged through the heater to the crude column, and an overhead cut of unstabilized gasoline is removed.

Two side cuts also may be taken, for example, light naphtha and kerosine, or kerosine and light gas oil. Overhead from the crude column may be stabilized in the primary superfactionator. For a specialty product the material can be put through the secondary superfractionator.

The crude tower bottoms are pumped to the flashing section heater for processing at atmospheric or reduced pressure. The overhead product is normally used as feed stock for further pilot plant processing.

The flashing section also may be arranged, using the heater for thermal reforming, to process a naphtha fraction for octane appreciation. Viscosity breaking also can be done.

Use of the two columns simultaneously permits taking as an overhead product a clean center cut.

Synthetic Rubber Use Exceeds October Output

Rubber manufacturing industries in the United States consumed a total of 102,293 tons of natural and synthetic rubber during October, an increase of 13 per cent over September and the second highest monthly total on record, according to the Office of Materials Distribution of the Department of Commerce.

Natural rubber consumed totaled 56,986 tons; GR-S, 35,929 tons; and inner-tube synthetic, 5,945 tons. Consumption of the GR-S type was considerably in excess of production.

Department of Commerce officials said the Office of Rubber Reserve will step up production of American-made rubbers to meet current requirements and inventory needs.

West Tulsa Works of Texas Co. Given Awards

The West Tulsa Works of The Texas Co. last week received recognition from the American Petroleum Institute and the National Safety Council for completing 787 days without a disabling accident. The period covered 1,253,468 man hours of work.

The last lost-time accident in the refinery occurred October 18, 1945. Previously the company had had records of 648 and 697 days without a disabling injury.

E. M. Reynolds, superintendent, was presented the A.P.I. certificate

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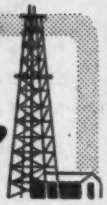

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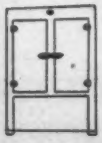

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and the N.S.C. certificate and flag in a ceremony at the refinery.

Cooperative to Install New Dewaxing Unt

Contracts for the installation of a dewaxing unit at its Coffeyville, Kans., refinery have been signed by Consumers Cooperative Association.

The new unit is expected to cost in excess of $1,500,000.

President Howard A. Cowden said the new methyl-ethyl-ketone process eventually may replace the cold-acid treatment, which has been used at the refinery for removal of wax from heavy lubricating-oil stocks.

The new unit will be in operation early in 1949.

Bayway Refinery Output Increased 37 Per Cent

Capacity of the Bayway refinery of Standard Oil Co. of New Jersey at Linden, N. J., has been increased 37 per cent to a total throughput of 176,000 bbl. daily, according to company officials.

The increase has been made possible by returning to service old or abandoned equipment. Previously the plant had a rated crude capacity of 135,000 bbl. daily and a cracking capacity of 91,000 bbl.

The company also has increased its production of burning and fuel oils by reducing its gasoline output. It has converted some thermal cracking equipment to crude-oil distillation service.

Stanolind, Carthage Sign Plant Output Contract

Stanolind Oil & Gas Co. will purchase all the chemical byproducts (oxygenated chemicals) produced in the synthesis gasoline plant now under construction at Brownsville, Tex., by Carthage Hydrocol, Inc.

Announcement of the contract was made December 22 by E. F. Bullard, president of Stanolind, and Guy George Gabrielson, president of Carthage.

Bullard also announced that a site has been acquired adjacent to the Carthage plant on which Stanolind will build a chemical recovery and separation plant.

The plant will produce aliphatic alcohols, aldehydes, acids, and ketones.

Comet Refinery Sold

Northwest Petroleum Co., Minneapolis, has purchased the small Minneapolis refinery of Comet Refining Co., which is currently running about 1,300 bbl. per day of crude from Hamilton Dome field in Wyoming.

Baytown Refinery Workers Granted 5 Per Cent Raise

HOUSTON.—A 5 per cent general pay raise has been granted the 6,600 workers at Humble Oil & Refining Co.'s Baytown refinery under an agreement reached between the company and the Baytown Employes Federation.

Under the agreement a cost-of-living allowance will be continued at $20 a month. The general 5 per cent increase is retroactive to December 1. Other employe federations are continuing negotiations with Humble for wage increases on behalf of other company workers.

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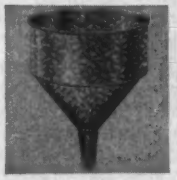

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PIPE LINES

Sinclair Takes Bids for 185-Mile Products Line

Sinclair Refining Co. is taking bids for the construction of a 185-mile 8-in. products line which will extend the company's new system from the Dallas-Fort Worth area to the Panova station, near Pauls Valley, Okla., on the Sinclair crude-oil trunk-line system. Specifications call for bidding the 185-mile project as one job. Work is to start about January 1 and it is expected that it will be finished in May or June.

H. C. Price Co. is now laying a 10-in. products line for Sinclair which will extend from the Houston refinery area via Bryan to the Dallas-Fort Worth area.

Welding Nearly Finished For Hearne-Dallas Line

In the laying of Texas Pipe Line Co.'s 172-mile 10-in. products line from Hearne, Tex., to Dallas, the contractor, Associated Contractors & Engineers, expects that welding operations will be completed by January 1 and that all pipe laying will be finished by the middle of January. Construction started October 7.

Early this week, the pipe gang was reported to be working within 12 miles of Dallas. The contractor is pushing the pipe-gang operations 18 to 20 miles ahead of the three ditchers. The seven bell-hole welders work nearly a mile behind the pipe gang. On December 18, the pipe gang lined up 13,500 ft. The largest amount of pipe handled on the project by the pipe gang on the best day was approximately 14,000 ft. Field headquarters of the contractor are maintained at Hillsboro, Tex.

After completion of the Hearne-Dallas line, an extension will be built from Dallas to Fort Worth. The project is being built in conjunction with Magnolia Pipe Line Co.'s 178-mile 12-in. line from Beaumont to Hearne.

Associated Contractors & Engineers started last week to lay a 14-mile 8-in. line for Texas Co. in the Harvey, La., area.

Mississippi River Fuel Prepares for More Loops

Construction of additional loops is to be undertaken for Mississippi River Fuel Corp. by R. B. Potashnick, a contractor, who has been laying pipe for looping for the Mississippi River Fuel system in recent months.

The additional looping, recently authorized by the Federal Power Commission, includes 199 miles of 22-in., 20 miles of 10-in. and 2.3 miles of 12-in. for stream crossing facilities. *(For details, see The Oil and Gas Journal, December 20, page 108.*

Correlating Committee Gets Corrosion Damage Data

The Correlating Committee on Cathodic Protection obtained data at its recent meeting in Pittsburgh which showed that a total of 1,515,000 miles of structures are subjected to corrosion in the United States. These include 965,000 miles of steel and iron pipe carrying crude oil, refined products, gas, and water; 125,000 miles of lead-sheathed electric cable, and 425,000 miles of steel rail track. The corrosion damage to these as well as other metal structures which are buried or are in contact with soil has been estimated to be about $1,000,000,000 annually in the United States.

The Correlating Committee recently organized by eight industry associations is headed by H. H. Anderson, vice president, Shell Pipe Line Corp. Other committee members representing the petroleum and natural-gas industries are: L. F. Scherer, The Texas Pipe Line Co.; Guy Corfield, Southern California Gas Co.; and F. J. McElhatton, Panhandle Eastern Pipe Line Co.

Induction Carrier Communication for Pipe Lines

Recent successful experience reported in connection with the application of induction-carrier communication by Kansas City Southern Railroad and Detroit, Toledo & Ironton Railroad has been attracting attention of pipe-line engineers. The possibilities of induction-carrier communication suggest that it might be used for communicating between the telephone lines of pipe-line trunk systems and company cars and trucks operating at distances as far as 30 to 40 miles from such telephone lines. The cars and trucks would have radio-type equipment. It has been pointed out that induction-carrier communication would not be used for ex-

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change of information between patrol planes and dispatchers. For that service, space radio equipment would be necessary where efforts may be made to provide that type of communication.

The induction-carrier communication utilized by railroads is for conversations with moving trains by the use of telephone lines paralleling the tracks.

Susquehanna Authorized To Acquire Two Companies

The Pennsylvania Public Utilities Commission last week authorized Susquehanna Pipe Line Co., of Philadelphia, to acquire ownership of Sun Pipe Line, Inc., of New York, and Sun Oil Line Co. of Ohio.

The commission said the move would improve coordination of interstate transportation and distribution of petroleum and petroleum products.

Argentine Line Is Laid By Three Spreads

Construction of the Argentine Government's 1,100-mile 10-in. natural-gas line is being handled by three spreads which are scheduled to progress at the rate of 6 km. (3.6 miles) per day. Work is going forward at three points on the route from the Comodoro Rivadavia fields to Buenos Aires.

At the southern end of the line seamless pipe is reported to be furnished by Dalmine, S. A., Dalmine, near Bergamo, Italy. In previously published reports, the name of this pipe manufacturer has been incorrectly given. Information regarding the construction organizations and the other firms supplying pipe was published in The Oil and Gas Journal, December 20, page 108.

Recently Direccion General del Gas del Estado, S.E. put in operation the terminal facilities, known as Branch B of the first section of the pipe line from Comodoro Rivadavia to Buenos Aires. These terminal facilities feed gas to the Buenos Aires area.

The completion of Branch B makes it possible to use the northern section of the pipe line for the storage of manufactured gas during the period when the remainder of the project is being completed. This procedure facilitates the program for supplying gas to the outlying suburbs on the southwest side of Buenos Aires including Floresta, Liniers, and Villa Devoto. Previously the gas-distribution facilities for these suburbs had been inadequate for transmitting from the Corrales manufactured-gas plant through the existing system which traverses densely populated sections of Buenos Aires.

To improve gas transmission for these suburbs, Direccion General del Gas constructed, as an initial step

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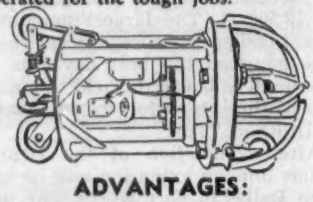

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in the Comodoro Rivadavia project, the Llavallol-Buenos Aires section of the new system. In connection with this Llavallol-Buenos Aires section three laterals have been built. One of these laterals connects with the Corrales manufactured-gas plant to transmit manufactured gas which passes through the other two laterals to Devoto and Belgrano. At the same time all of these lines in the Llavallol-Buenos Aires section are used for gas storage. For the purpose of maintaining gas in this section of the system at the desired pressure, two compressors have been installed at the Corrales plant.

Manufacturers Light & Heat Lays Pennsylvania Line

Manufacturers Light & Heat Co. is laying 130 miles of 14-in. natural-gas line from Port Jervis, N. Y., to Coatesville, Pa. More than 40 miles had been laid. The project is being built under contract by Williams Brothers Corp. Work is supervised by G. A. Manuel.

Rocky Mountain Laying Rawlins-Medicine Bow Line

Rocky Mountain Gas Co. is laying a 54-mile 9-in. natural-gas line from Rawlins to Medicine Bow, Wyo., according to reports. Work on the line has been approximately half completed by the contractor, Dawson & Corbett. Because of pipe shortage it is expected that completion of the line will be delayed.

Ozark to Install Motors Totaling 35,000 hp.

Ozark Pipe Line System will equip eight pump stations with Westinghouse electric motors having a total of 35,000 hp. At each station, three 1,250 and one 700-hp. motor will drive the large pumping units. A number of smaller motors will be used for auxiliary services. Power will be delivered through eight outdoor substations with three 1,667-kva. transformers and related switching equipment. Simultaneously Shell Pipe Line Corp. is reported to be planning to install not less than 5,000 hp. of electric motors to replace diesel engines at stations serving its Cushing, Okla.-Wood River, Ill., trunk system which will be paralleled by the Ozark project.

Shell Pipe Line Corp. and The Texas Pipe Line Co. will own undivided interests in the 500-mile Ozark Pipe Line System which will have 20-in. pipe between Cushing and Wood River, and 16-in. between Wood River and Salem, Ill. Shipment of electrical equipment is to start early in the fall of 1948. The pipe line is scheduled for completion in the first quarter of 1949.

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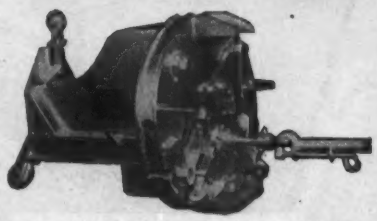

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General American Conkey Dewaxing filters installed in recently completed M.E.K. lube oil plant.

Exploration and Drilling

South Texas Giant in Limelight

TWO strikes this week at opposite ends of that enormous accumulation of oil, condensate, and natural gas extending from Agua Dulce on the north to La Gloria on the south, sometimes called the South Texas Giant, serve to emphasize the complexity as well as the size of this rich hydrocarbon reservoir.

On the north end, J. M Flaitz 1 Matilda Balzar, in the southeast corner of Section 79, George H. Paul's Subdivision, on the east flank of Agua Dulce field, about 1½ miles southeast of the town of Banquete, opened up additional territory. This well lies about ½ mile east of the gas-condensate producing area, and by finding 37°-gravity oil in the 7,300-ft. sand, extended oil production about a mile north-northeastward along the east flank.

The well was drilled to a total depth of 7,425 ft., and on drill-stem test at 7,300-20 ft., recovered 460 ft. of 37°-gravity, pipe-line oil. The working pressure on a ½-in. choke was 525 psi., the bottom-hole pressure was 2,280 psi. open and 2,880 psi. closed. Casing has been set at 7,367 ft. and production tests are under way. Meantime an offset, 934 ft. south, is already making hole. This is L. M. Lockhart 1 W. R. Richardson, located 467 ft. from the north and east lines of Section 80, George H. Paul's Subdivision of Driscoll Ranch, Andres de la Puerto grant, on a 171-acre lease.

Second Strike

Meantime, nearly 50 miles southwest, Magnolia Petroleum Co. 1 Ed L. Weathers, in Lot 2, Block 8, subdivision of lands adjoining the townsite of La Gloria, opened a new oil sand, the Stanley, topping it at 7,270 ft., and producing from perforations at 7,273-78 ft. The new pay zone produced 145 bbl. per day of 40.2°-gravity oil through a 9/64-in. choke. It was also dually completed in the Loma Blanca sand at 6,525-42 ft., from which reservoir it flowed 74 bbl. of 39.8°-gravity oil per day through a 5/32-in. choke.

The exact evaluation of these two strikes will have to be left to those exploration experts who are specializing in this field because its complexity, as well as its enormous size, make it a full-time job for many men. Considering that Agua Dulce was first discovered to be productive as far back as 1928, the fact that 19 years later important wildcat strikes are being made is amazing.

However, the strike at La Gloria would be newsworthy at any time, and is overshadowed only by the fact that it comes at the same time as the one at Agua Dulce. La Gloria was first discovered in 1939, so a new sand discovery 8 years later indicates that there is still considerable knowledge to be gained there.

Some idea of how difficult it has been to evaluate the various discoveries as they came along can be gained by reading annual discussions of the exploration and development results in this area. Specific articles have appeared in The Oil and Gas Journal, June 12, 1941, page 24; August 11, 1945, page 74, and November 9, 1946, page 60.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

SOUTH LOUISIANA.—Humble Oil & Refining 1 State, Lease 1,256, wildcat in Calcasieu Lake, Cameron Parish, is drilling below 14,018 ft. If successful, this well will be the deepest producer on record. Gulf has set 5½-in. production pipe in 1 Hernandez et al, wildcat in Lafayette Parish. Total depth is 12,950 ft., with pipe set at 12,198 ft.

CANADA.—Tests indicate Leduc may be extended 3¼ miles to the northwest. Turner Valley has three wells testing production in the north extension of the field.

TEXAS GULF COAST.—According to latest reports, Holmes Drilling et al are preparing to drill ahead in 1 Turner et al, important wildcat in the Bonney area of Brazoria County, 6½ miles southeast of production in Lochridge field, after setting 10¾-in. surface pipe to 2,520 ft. Initial plans are to drill the test to 9,500 ft., but if subsurface data is encouraging, it will be carried down to the 11,000 ft. or 12,000 ft. levels. "Baker," a new gas pool in Live Oak County, was opened by Rowe 1 Baker et al, 4½ miles north-northwest of Clegg.

ROCKY MOUNTAIN.—Texas Co. wildcats at Adon, Powder River Basin, Wyoming, and Ragged Point, Musselshell County, Montana, have begun plugging back and testing oil shows discovered on the way down. Continental opened a shallow Dakota pool in a fault block at the south end of Rattlesnake field, New Mexico. Carter Oil Co.'s Elk Basin test has oil showing in 3 horizons. Maudlin Gulch wildcat, Moffat County, Colorado, which was abandoned 2 years ago, became a discovery upon being worked over.

SOUTHWEST TEXAS.—Continental Oil 1 Welder flowed 129 bbl. of oil daily to open the New Angelita field in San Patricio County. In the same county, a deeper pay zone was found in White Point field.

EAST TEXAS.—San Augustine County may get its first distillate discovery for this year in Byrd Oil Co.'s 1 Blount, 3½ miles west of San Augustine, which tested shows at a drilling break at 8,472 ft.

PERMIAN BASIN.—The Jordan Ellenburger field, Ector County, got a third pay zone in Gulf 20-E-B Connell, which flowed 175 bbl. of high-gravity oil from a deep sand in the Simpson zone.

NORTH CENTRAL TEXAS.—Two tests promise to prove additional acreage in Goldsmith field, Wichita County. Wise County gets its first important production in a 300-bbl. well, 2 miles west of Chico.

MISSISSIPPI

Good Oil Well Extends LaGrange

JACKSON.—In the La Grange field, Adams County, James E. Kemp 2 H. M. Marks, most northerly producing well in the field, has been completed as a good well, and the possible northern limits of production still remains a question. On a 4-hour test through 3/16-in. top choke the well flowed at rate of 397 bbl. per day with 550 psi. tubing pressure. It later flowed 167 bbl. through a 10/64-in. top choke on 24-hour test with 580 psi. tubing pressure. Perforations are in the middle member (Wilson sand) of the 6,200-ft. producing zone from 6,247-54 ft. La Grange now has 45 producing wells with 20 being completed from the Baker sand, 23 from the Wilson-Parker sands and 2 multiple completions from both Baker and Wilson.

At Sandersville, Jones County, Union Sulphur Co. has completed 1 Earline Parker, 31-10n-10w, and 1 A. E. Fall Estate, 8-9n-10w, as noncommercial. Both wells had produced small amounts of very heavy oil from the City Bank sand zone but the daily rate was not sufficient to pay current operating costs.

Five wildcat locations were reported this week: The Texas Co. 1 E. G. Whitehead et al, 22-18n-5e, in Carroll County; Donald M. Reese 1 I. R. Anderson et al, 22-4n-8w, in Greene County; Harris-Payne-Johnson 1 J. E. Yarber, 36-10n-10w, in Jones County; Danciger & Gulf 1 M. P. Morehead, 11-5n-6e, in Scott County; and William Cordell 1 School Land, 16-7n-5w, in Wayne County. Eight field locations were reported, three in La Grange, Adams County; two in Mallalieu in Lincoln County; and one each in Baxterville, Lamar County, Carthage Point in Adams County, and Eucutta in Wayne County.

MISSISSIPPI WILDCAT FAILURE

Adams County: Danciger Oil & Refining Co. 1 James B. McClure, 69-8n-2w, dry, TD 7,225 ft., Sparta 2,600 ft., Wilcox 3,872 ft.

ALABAMA WILDCAT FAILURE

Escambia County: The Texas Co. 1 Wiggins-Cobb, 30-2n-10e, dry, TD 7,015 ft.

GEORGIA WILDCAT FAILURE

Decatur County: D. E. Hughes 1 H. W Martin, Land Lot 189, Land Dist. 15, dry, TD 3,705 ft., Eutaw 2,780 ft., Marine Tuscaloosa 3,185 ft., lower Tuscaloosa 3,353 ft., Massive sand 3,448 ft., Comanche 3,472 ft.

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TEXAS GULF COAST

Live Oak County Gets New Gas Pool

HOUSTON.—A new gas pool, "Baker," for Live Oak County has been opened by W. Earl Rowe 1 Earl M. Baker et al, located 4½ miles north-northwest of Clegg, in the Seale & Morris Survey 7. Drilled to a total depth of 3,513 ft., this well flowed an initial production of 4,000,000 cu. ft. of gas per day on open flow, shut-in pressure 780 psi., no water. Top of pay was 2,002 ft. with perforations for completion at 2,002-25 ft.

Production at Sugar Valley field in Matagorda County has been extended approximately 1,500 ft. in the new producing area south of east side production by Superior Oil Co. of California and John Blaffer 1 Angeline Spencer, in the Freeman Pettus Survey. On potential gage the well flowed 267 bbl. of oil per day through a 13/64-in. choke with 600 psi. flowing pressure on the tubing and a gas ratio of 565 cu. ft. Corrected gravity is 30.2°. Total depth is 10,290 ft. with perforations for completion at 9,958-66 ft.

Another producer for the southeast extension area of Sugar Valley field, Matagorda County, has been completed by Superior of California and John H. Blaffer. Their 2-A W. J. Culbertson in the Freeman Pettus Survey, was completed for a potential gage of 376 bbl. of 29.4°-gravity oil per day through a 13/64-in. choke, with flowing pressure 910 psi., and no water in the flow. Total depth is 10,290 ft., with pipe cemented on bottom, and perforations for completion at 9,958-65 ft.

A potential gage has been made on Frazier & Grubb & Hawkins 1 J. R. Farmer, discovery well southwest of Clodine field in Fort Bend County. Tubing completion was an estimated 100 bbl. of condensate and 2,942,000 cu. ft. of gas per day through a ¼-in. choke, through perforations at 7,415-20 ft. Casing completion was through perforations at 7,260-65 ft., for an estimated 66.5 bbl. of condensate and 2,706,000 cu. ft. gas per day through a ¼-in. choke. Open flow on the tubing was 5,000,000 cu. ft. per day and 7,400,000 cu. ft. per day on the casing. This well is in the I&GN Survey, 1½ miles southwest of Clodine field production. Total depth is 7,665 ft.

In the Gilbert Ranch area of Jefferson County, Meredith, Clegg & Hunt 1 Gilbert, in the John Richard Survey, are preparing to set pipe for a production try. Discovery sands showing gas and condensate were logged from 8,770-8,812 ft. Operators were drilling below 8,850 ft.

There were 32 new locations reported this week, 7 of which are wildcat starts, 2 in Brazoria, 1 each in Hardin, Jefferson, Karnes and Refugio counties. One new gas pool was opened in Live Oak County, while 5 wildcats were dry, 1 each in Bee, Brazoria, Live Oak, Matagorda and Victoria counties.

TEXAS GULF COAST SUCCESSFUL WILDCAT

Live Oak County: New gas pool "Baker"—W. Earl Rowe 1 Earl M. Baker et al, Seale & Morris Sur. 7, 4½ mi. N-NW

of Clegg, and 3 mi. SE of Chapa field, top pay 2,002 ft., TD 3,513 ft., perf. 2,002-25 ft., IP: 4,000,000 cu. ft. gas per day on open flow, shut-in pressure 780 psi., no water.

TEXAS GULF COAST WILDCAT FAILURES

Bee County: Dirks Bros. & Tide Water Assoc. Oil Co. 1-C Dugat Est., James Gray Sur., 1 mi. SW of Dirks field and 2 mi. SW of West Cosden-Mackhank field, dry, TD 7,505 ft.

Brazoria County: Wm. Helis 1 Joseph Heim, Jr., S. Marsh Sur., South Chenango area, dry, TD 10,454 ft.

Live Oak County: J. H. Ledlow 1 Josephine McClelland, Geo. West Ranch Subd., Michael Caronican Sur. 35, Albert West area, dry, TD 2,690 ft.

Matagorda County: Star Oil Co. 1 A. Simon, in Jos. Reese Lge., South Lucky area, dry, TD 9,604 ft.

Victoria County: A. W. Crosby, Inc. 1 F. J. Kallus et al, Milton Bennett Sur., 2½ mi. NE of North Telferner field, and 5 mi. N of Telferner, dry, TD 4,541 ft.

SOUTH LOUISIANA

Humble May Bring In Record Deep Producer

NEW ORLEANS.—Humble Oil & Refining Co. 1 State-Calcasieu Lake, Lease 1,256, in Cameron Parish, is testing, after indicating gas production on a drill-stem test through perforations at 13,993-14,002 ft. If successfully brought into production, this well will be the deepest producer on record. Total depth is 14,024 ft., with 7-in. pipe cemented at 14,018 ft. for completion. Operators are making further tests before running tubing for a completion try. To date, the deepest production on record is The Texas Co. 1 Lafourche Basin Levee District at Queen Bess Island field in Jefferson Parish, which flowed 49 bbl. of 44.1°-gravity condensate along with 6,188,000 cu. ft. of gas through perforations at 13,879-904 ft. This well was completed in July of this year.

Casing has been set for a completion attempt at Gulf Refining Co. 1 Hernandez et al, 18-10s-4e, wildcat test 4 miles southeast of the Duson field discovery well, Lafayette Parish, The test was drilled to 12,950 ft. and pipe was cemented at 12,-198 ft.

Kerr-McGee Oil Industries, Inc. 1 State Lease 754, Block 32, discovery 12 miles out in the Gulf of Mexico off Terrebonne Parish shore, is steadily increasing in production. A late gage shows the well flowing at the rate of 897 bbl. of 25°-gravity pipe-line oil daily through a ½-in. choke with 70 psi. flowing pressure on the tubing and 200 psi. casing pressure. At time of final completion the well gaged 600 bbl. daily on the same choke, showing 4 per cent water, and had 25 psi. pressure on the tubing with 200 psi. on the casing. Total depth is 2,563 ft. in salt, top of salt at 2,537 ft. Production is through perforations at 1,734-50 ft.

Gulf Refining Co. 1-E Haas-Hirsch, discovery well at Krotz Springs, 21-6s-7e, St. Landry Parish, has been reworked and has proved several new producing levels for the area. Total depth is 12,298 ft., and new completion is through perforations at 6,822-54 ft. On potential test it gaged 249 bbl. of condensate along with 5,030,000 cu. ft. gas per day through a 24/64-in. choke, with flowing pressure on tubing 2,030 psi., and shut-in pressure of 2,400 psi. Prior to completion, several tests were made, as follows: at 7,172-80 ft., it flowed 495 bbl. condensate per day through a 24/64-in. choke, with 2,225 psi. flowing pressure; at 7,108-14 ft., it flowed 406 bbl. of condensate and 6,522,000 cu. ft. gas through a 28/64-in. choke, with 2,125 psi. flowing pressure; at 6,940-48 ft., it gaged 538 bbl. of condensate and 6,284,000 cu. ft. gas per

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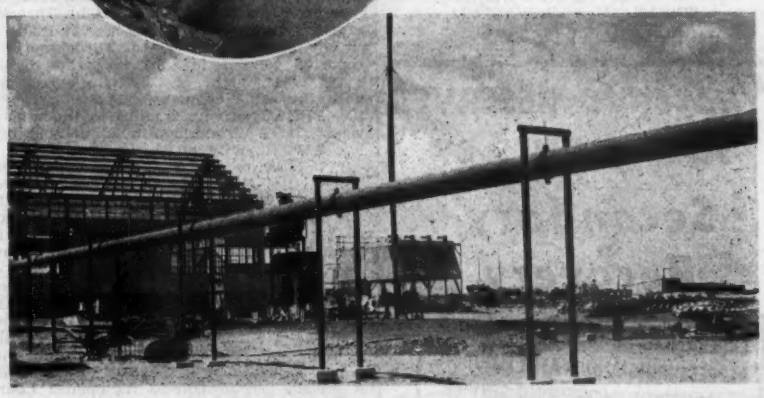

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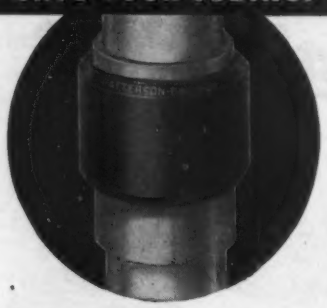

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day through a 28/64-in. choke, with 2,100 psi. flowing pressure on tubing.

The 21 new locations this week included only 2 wildcat starts, 1 each in Iberville and Jefferson parishes. One wildcat was completed dry in Calcasieu Parish while 11 oil wells were completed in proven areas.

SOUTH LOUISIANA WILDCAT FAILURE

Calcasieu Parish: S. W. Richardson, Inc. 1 R. Benoit, NW SE 24-9s-7w, 1 mi. S. of Iowa field production, dry, TD 6,180 ft.

N. CENTRAL TEXAS

Two Offsets Promise To Extend Goldsmith

WICHITA FALLS.—Two offset tests to the discovery of the Goldsmith field, 4 miles north of Holliday, in Wichita County, had saturated oil sand, and promised to prove additional acreage. Linda Jo Oil Co.'s 1 W. H. Ramey, Section 3, SPRR survey, a west offset to the A. Goldsmith 1 Kempner discovery well, had promising oil sand from 3,918-28 ft., and was waiting on cement after setting casing to 3,908 ft. Roger H. King et al 1 Pearl Boyd, a north offset in the J. T. Lewis survey, topped the sand at 3,900 ft., drilled to 3,910 ft. and set casing. It was expected to drill in this week.

Cities Service Oil Co. 1 B. O. Manning, 2 miles west of Chico, became Wise County's first important producer early this week when it flowed better than 300 bbl. of 41°-gravity oil in 19 hours, before being shut in for additional storage. Perforations were in the Caddo limestone between 5,203-35 ft. Gas-oil ratio was 590 cu. ft. Total depth is 7,052 ft., in the Ellenburger.

James H. Snowden et al 1 Wright, Throckmorton County wildcat in Block 294, BBB&C survey, 3 miles southeast of Throckmorton, reported top of the Strawn sand to be some 30 ft. high, at 3,577 ft., correlated with the same company's 1 Marrs, Block 289, BBB&C survey, 2 miles to the northwest. The 1 Wright continued drilling below 3,584 ft., with no shows.

The 1 Marrs was ready for completion tests in the Marble Falls, being perforated between 4,734-40 ft. Operators were installing pump, as the well would not flow except after agitation. On swabbing tests, it produced at the rate of 15 bbl. of oil an hour.

Also in Throckmorton County, Bay Petroleum Corp. 1 Whitaker, Block 851, TE&L survey, was a promising extension to the Manning-Atkinson field. On a 1-hour drill-stem test at 4,058-70 ft., in the Caddo, the recovery was 60 ft. of slightly oil-cut mud. A second test to 4,070-95 ft., open 1 hour, returned the same amount of mud cut with oil and some gas. Bottom-hole pressure was 1,300 psi. in 15 minutes. Location is 1 mile from nearest production.

In Montague County, observers saw a possible Strawn discovery at Sinclair Prairie Oil Co. and Continental Oil Co. 1 Gronow, 1 mile southwest of the town of Montague. The well was being swabbed through tubing, at the rate of two trips an hour, from perforations between 4,079-89 ft. Definite amount of recovery was not made known, but it was said to be all oil, with some gas. Seven miles northwest of Bowie, The Texas Co. 1 Benson had total depth at 6,458 ft., and stopped to run casing for production tests. It was said to have shown possibilities of production in the Bend conglomerate. In northwest Montague County, A. R. Dillard 1-B Walker, Limestone County School Land survey, was drilling below 6,275 ft. with no shows.

NORTH CENTRAL TEXAS SUCCESSFUL WILDCATS

Archer County: Southern Petroleum Exploration Co. et al 1-E L. F. Wilson, Wm. Walker Sur., 51½ mi. N Archer City, pumped 20 bbl. oil per day, plus 100 bbl. water, shot in sand 3,680-3,800 ft., TD 4,267 ft.

Cooke County: V. D. Randall & F. H. Kiel 1 V. D. Randall, Jacob Lawson Sur., 3 mi. SE Gainesville, pumped 12 bbl. oil per day, oil sand 1,602-07 ft., TD.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: H. A. Mills & V. N. Mills 1 D. L. Wolf, Sec. 1, SPRR Sur., 12 mi. SW Archer City, dry, TD 1,450 ft. in shale, sand with show of oil 1,106-08 ft.

Clay County: Fowler Farm Oil Co. 1 W. T. Rodgers, Sec. 14, BBB&C Sur., 2 mi. NW Charlie, dry, TD 2,505 ft. in lime.

Cooke County: H. L. Nutting 1 Jennie Biffle, A. J. Miller Sur., 1 mi. E Myra, dry, TD 2,044 ft., Ellenburger 2,010 ft.

Jack County: Warren Oil Corp. 1 D. S. Bruton, Sec. 4, BS&F Sur., 6½ mi. SW Jackboro, dry, TD 5,569 ft., Caddo 4,340 ft., show of oil 4,835 ft., Mississippian 5,460 ft., Ellenburger 5,460 ft.

Young County: M. W. Blair 1 Clint Heard, Sec. 305, TE&L Sur., 1½ mi. E Spring Creek, dry, TD 1,257 ft. in sand, Gunsight lime 1,194-98 ft., sand with show of oil 1,198 ft.

WEST CENTRAL TEXAS SUCCESSFUL WILDCATS

Callahan County: B. F. Phillips 1 N. H. Williams, Sec. 139, University Sur., 2½ mi. NW Putnam, flowed 8,050,000 cu. ft. gas per day, gas sand 565-575 ft., TD.

Eastland County: Lone Star Producing Co. 1 G. P. Mitcham, Sec. 491, SPRR Sur., 5 mi. NW Cisco, flowed 1,800,000 cu. ft. gas per day, top Caddo 3,375 ft., perforated 3,946-64 ft., TD 4,551 ft., elev. 1,653 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Jones County: Plymouth Oil Co. 1 C. H. Heald, Blk. 2, SPRR Sur., 5 mi. SW Anson, dry, TD 2,783 ft. in lime.

Nolan County: Exploration Drilling Co. 1 Z. A. Stroman, Sec. 81, Blk. 21, T&P Sur., 4½ mi. SE Sweetwater, dry, TD

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6,804 ft., Coleman Junction 3,094 ft., Sedwick 3,144 ft., Dotham 3,290 ft., Noodle Creek 3,408 ft., Saddle Creek 3,670 ft., Ellenburger 6,510 ft., elev. 2,295 ft.

Stephens County: Prairie Oil & Gas Co. 1 P. G. Tucker, Sec. 21, Blk. 7, T&P Sur., 9 mi. SW Breckenridge, dry, TD 4,179 ft., Caddo 3,411 ft., sand with show of oil 4,009 ft., Ellenburger 4,168 ft., elev. 1,423 ft.

Taylor County: Carl Hovgard 1 Baccus, Blk. 4, Burr & Caswell Sur., 1½ mi. SE Blair, dry, TD 3,970 ft., Coal 2,762 ft., Flippen 2,775 ft., Cook 2,863 ft., Reef 3,709 ft., elev. 1,968 ft.

Sussex Oil Co. 1 D. F. Killough, Blk. 67, Blind Asylum Lands, 8 mi. SE Abilene, dry, TD 2,055 ft.

EASTERN TEXAS

Test Shows Distillate At Drilling Break

DALLAS.—Byrd Oil Co. 1 Blount, 3½ miles west of San Augustine, appeared to have prospects of becoming a distillate discovery when it found shows in testing a drilling break at 8,472 ft. which drilled from 4 to 11 minutes per foot. A test of the Pettit from 8,471-91 ft., using 2,000 ft. of water cushion and ¼-in. chokes, produced an immediate blow at the surface but registered little pressure flowing or shut in. In 1½ hours it recovered the water cushion, the bottom 600 ft. being cut with gas and distillate, and 45 ft. of mud cut with distillate. Flowing bottom-hole pressure was 1,575 ft. Operators continued drilling below 8,491 ft.

In Harrison County, W. C. Fezel 1 George Bishop, 3½ miles north of Elysian Fields, was preparing to drill ahead after cores and tests had very slight shows. The first gas odor in cores was reported between 6,430-50 ft.; between 6,457-77 ft. the recovery was fine sand with distillate odor, and oil taste in the bottom. Operators then ran a drill-stem test at 6,455-77 ft., open 16 minutes, which produced a slight blow and recovered 20 ft. of gas-cut mud, with no shows of oil or salt water. Flowing surface pressure was 85 psi.

Cass County had three wildcat tests drilling ahead. Arkla Oil Co. 1 Lindsay, Frazier survey, 11 miles north of Atlanta, was drilling below 5,460 ft. This test was unofficially reported to have had a drilling break in the Paluxy, drilling 1 minute per foot, but depth and details of the break were not released. Arkla's 1 C. I. Glass, 5 miles southeast of Atlanta, was last reported drilling ahead below 5,630 ft. in shale. Shell Oil Co. 1 Gerald Smith, 2½ miles west of Bloomburg, had recovered junk from the hole, and was drilling ahead below 8,619 ft. in shale and red beds.

The LaGloria Corp., Corpus Christi, this week was preparing to take over approximately 5,000 acres on the west flank of the Waskom oil and gas field in Harrison County, from E. C. Johnston, Longview, Texas, independent operator. Included in the deal are seven producers and another well now nearing completion. Assignments filed in Marshall, Tex., disclosed the block was turned over to LaGloria for $1,250,000, subject to an additional $750,000 out of production and subject to a ⅛ override reserved by F. A. Fuller, of Shreveport, when the block was acquired by Johnston. The transfer to LaGloria was said to cover oil and gas leases, together with pooling, unitization and operating agreements affecting them, covering 31 tracts of land. Property involved lies in the following surveys: M. W. Coleman, S. Holloway, S. F. Alston, John Lowe, Benjamin Long, Joseph Nation, William Parks, John Nolen, B. F. Hooper, James Steele, William Steele, James Shandoin, P. Mitchell, G. W. Mitchell, B. Mitchell, M. Mitchell and James J. Blair.

EAST TEXAS SUCCESSFUL WILDCAT

Denton County: Harvey Drilling Co. 1 J. B.

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Waide, T. Carpenter Sur., A-271, 7 mi. NW Sanger, pumped 26 bbl. oil a day, oil sand 1,657-68 ft., TD.

EAST TEXAS WILDCAT FAILURE

Limestone County: M. M. Miller 1 J. C. Rogers, P. S. McNeil Sur., 10 mi. W Groesbeck, dry, TD 6,173 ft., Glen Rose 3,134 ft., Massive anhydrite 3,789-3,878 ft., Pettit 4,222 ft., Travis Peak 4,329 ft., by samples.

SOUTHWEST TEXAS

San Patricio Discovery Flows 129 Bbl. Daily

CORPUS CHRISTI.—A new oil pool, New Angelita, in San Patricio County, has been opened by Continental Oil Co. 1-S J. F. Welder, located in the Tares & Villareal Survey, 5 miles south-southeast of Edroy, and 4 miles northwest of Calallen. Drilled to a total depth of 7,601 ft., with 6-in. oil string set to 7,593 ft., on potential gage flowed 129 bbl. of 40.8°-gravity oil per day through a ¼-in. choke, from perforations at 5,976-98 ft. Location has been made for 2-S Welder.

Also in San Patricio County, a deeper oil pay zone has been opened in East White Point field by Plymouth Oil Co. 3-G M. K. and L. B. Cole, in George H. Paul's Subdivision of Coleman-Fulton Pasture. On potential test this well flowed 242 bbl. of oil per day through a ⅛-in. choke, from perforations at 6,784-87 ft., with top of pay at 6,782 ft., and total depth 6,788 ft. The 5½-in. casing is on bottom.

H. H. Howell 2 Magnolia Petroleum Co. opened a new oil pay for Piedras Pintas field, Duval County, with pay topped at 2,182 ft. Initial production, from perforations at 2,190-98 ft., was 265 bbl. of 48.5°-gravity oil per day flowing through a 3/16-in. choke. Total depth is 3,027 ft.

In Jim Wells County, La Gloria pool, Magnolia Petroleum Co. 1 Ed L. Weathers, in Lot 2, Block 8, subdivision of lands adjoining the townsite of La Gloria, opened a new oil sand. The new Stanley sand was topped at 7,270 ft., with perforations at 7,273-78 ft., and the well flowed an initial production of 145 bbl. of 40.2°-gravity oil per day through 9/64-in. choke. This well was dual-completed, with perforations in the Loma Blanca sand at 6,525-42 ft., from which it flowed 74 bbl. of 39.8°-gravity oil per day through 5/32-in. choke. Total depth is 7,500 ft.

La Gloria Corp. 1 Moos, wildcat in Jim Wells County, approximately 8 miles southwest of Ben Bolt, is reported to be flowing approximately 10 to 12 bbl. of oil per day from perforations at 6,234-46 ft. Total depth is 6,520 ft., with 5½-in. casing set to 6,312 ft. This well is 2 miles northeast of the Bandera field and 6 miles southwest of Ben Bolt field, in Las Anacuas Grant to Vicente Ynojosa.

There were 63 new locations reported this week which included 20 wildcat starts, 5 in Jim Hogg County, 4 in Nueces County, 3 in Edwards County, 2 each in Duval and Zapata counties, and 1 each in Caldwell, Medina, San Patricio and Starr counties.

SOUTHWEST TEXAS SUCCESSFUL WILDCATS

Duval County: New oil pay, Piedras Pintas field—H. H. Howell 2 Magnolia Pet. Co., J. Poitevent Sur. 185, top pay 2,182 ft., TD 3,027 ft., perf. 2,190-98 ft., IP: 265 bbl. oil per day through a 3/16-in. choke, gas-oil ratio 420 cu. ft., TP 300 psi., CP 500 psi., gravity 48.5°, no water.

Jim Wells County: New oil pay, LaGloria pool—Magnolia Pet. Co. 1 Ed L. Weathers, Lot 2, Blk. 8, subd. of lands adjacent to the townsite of LaGloria, dual completion: Top pay 6,525 ft. (Lome Blanca sand), IP: 74 bbl. oil per day through 5/32-in. choke, perf. at 6,525-42 ft., gas-oil ratio 1,160 cu. ft., TP 260 psi., gravity 39.8°, no water; top pay 7,270 ft., Stanley sand (new

pay), perf. 7,273-78 ft., IP: 145 bbl. oil per day through 9/64-in. choke, gas-oil ratio 950 cu. ft., CP 1,000 psi., gravity 40.2°, no water, TD 7,500 ft.

San Patricio County: New oil pool, New Angelita—Continental Oil Co. 1-S J. F. Welder, Tares & Villareal Sur., 5 mi. S-SE of Edroy, 4 mi. NW of Calallen, top pay 5,976 ft., TD 7,601 ft., perf. 5,976-98 ft., IP: 129 bbl. oil per day through a ¼-in. choke, gas-oil ratio 789 cu. ft., TP 280 psi., casing sealed, gravity 40.8°.

San Patricio County: New oil pay, East White Point field—Plymouth Oil Co. 3-G M. K. & L. B. Cole, Geo. H. Paul's Subd. of Coleman-Fulton Pasture, top pay 6,782 ft., TD 6,788 ft., perf. 6,784-87 ft., IP: 242 bbl. oil per day through a ⅛-in. choke, gas-oil ratio 693 cu. ft., TP 1,200 psi., CP 1,400 psi., gravity 42.4°.

SOUTHWEST TEXAS WILDCAT FAILURES

Bexar County: Arkansas Fuel Oil Co. 1 Geo. Burkhardt, E. L. Monjares Sur., 7 mi. NE of Elmendorf, dry, TD 5,098 ft.

Duval County: V. G. Schimmel et al 1 Perez-Barrera, T&NO RR Sur. 141, 9 mi. NE of Bruni, dry, TD 3,410 ft.

Taylor Refg. Co. 1-L E. A. Parr, Sur. 279, 6 mi. NW of San Diego, 1 mi. N of Agua Prieta field, dry, TD 4,903 ft.

LaSalle County: Newman Bros. Drlg. Co. & Skinner & Eddy Corp. 2-F South Texas Syndicate, H&GN Sur. 103, 8½ mi. S of Washburn field, dry, TD 5,320 ft.

Milam County: Taylor Refg. Co. 1 R. L. Batte, 2 mi. NE of Milano, G. M. Gilliland Sur., dry, TD 3,265 ft.

Nueces County: Golding-Farris Drlg. Corp. 1 J. C. Parr et ux, in Canutillo Colony Ditch Co., 1 mi. W of North Luby-Petronila field, dry, TD 8,503 ft.

San Patricio County: Southern Mineral Corp. 1 W. Laechlin, Sec. 41 of Geo H. Paul's Subd. of Welder Ranch, 5 mi. N-NW of Edroy, dry, TD 6,250 ft.

Starr County: Sun Oil Co. 1 Homer P. Lee, in City of San Antonio Sur. 269, 2½ mi. E of North Rincon field, dry, TD 7,003 ft.

Webb County: Texon Drlg. Co. 1 Z. Laurel, in Victor Laurel Sur. 270, 5 mi. N of Oilton, dry, TD 1,940 ft.

Willacy County: H. L. Hunt 1 J. J. Hearne, Lot 16, Blk. 77, Gulf Coast Irr. Co. Subd., 1¾ mi. N of San Perlita, dry, TD 10,504 ft.

MICHIGAN

All Wildcats for Week Prove Unsuccessful

SAGINAW.—Thirteen wildcat completions, every one of them dry, accounted for a disappointing week in Michigan oil fields. From a total of 19 completions only two got crude production and one other was a small gas well. The wildcat failures, recorded in eight counties, included four in Allegan alone. The crude producers were in Newaygo's big Kimball Lake field, which came in for a daily initial potential of 1,440 bbl., and a 50-bbl. after-acid well in the Kawkawlin field of Bay County.

MICHIGAN WILDCAT FAILURES

Allegan County, Cheshire Township: Eric P. Schelling 1 L. C. Miller, SW NW NE 16-1n-14w, dry in Traverse lime, TD 1,324 ft.

Gun Plains Township: Wadsworth & Cook 1 Samuel Laverack, SW NW SW 35-1n-11w, dry in Traverse lime, TD 1,459 ft.

Martin Township: Ide Oil & Gas Corp. 1 Frank D. Hall, NE NW NE 31-2n-11w, dry in Alpena, TD 1,660 ft.

Throwbridge Township: Max Spidel 1 Henry C. Hecht, SE NE SE 7-1n-13w, dry in Traverse lime, TD 1,344 ft.

Arenac County, Moffat Township: Don Rayburn 1 Harold J. McFarlan et al, SE NE NW 34-20n-3e, dry in Dundee, TD 3,026 ft.

Ionia County, North Plains Township: Fisher-McCall Oil & Gas, Inc. 1 Charles Wilder, NW NW SE 29-8n-5w, dry in Detroit River, TD 3,049 ft.

Mecosta County, Sheridan Township: Michigan Consolidated Gas Co. 1 Carpenter et al, NW SE NW 35-15n-7w, dry, TD 1,531 ft.

Wheatland Township: Michigan Consolidated Gas Co. 1 Keller-Dralette et al, C NE 16-14n-7w, dry, TD 1,435 ft.

Montcalm County, Fairplains Township: Leonard Oil Co.-F. F. Uhl 1 Chester W. Johnson, SE SW NW 7-9n-7w, dry in Dundee, TD 3,177 ft.

Winfield Township: Chapman Oil Co. 1 Elisha A. Jones et al, SW NE SE 18-12-9w, dry in Detroit River, TD 3,450 ft.

Muskegon County, Whitehall Township: Eugene Hillard 1 William J. Ellers, SW SW SW 13-12n-17w, dry in Traverse lime, TD 1,777 ft.

Roscommon County, Nester Township: Ohio Oil Co. 1 Roseville Nester Gun Club, NW NW NW 17-21n-1w, dry in Dundee, TD 3,904 ft.

Van Buren County, Columbia Township: Norman L. Stevens 1 W. E. Fry, SE SE SW 21-1s-15w, dry in Traverse lime, TD 1,169 ft.

KANSAS

Test May Connect Heyen And West Heyen Pools

A HALF-MILE extension well to the newly opened West Heyen pool in Stafford County shows promise of connecting the new pool with Heyen pool proper. Musgrove Petroleum Corp., Jones, Shelburne, and Farmer, and C-G Drilling Co. 2 Lanter-

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man, SE NE NW 23-22-12, halfway between the two pools, had 3,000 ft. of oil in hole after plug was drilled. Test cut Arbuckle at 3,674 ft. and was drilled to total depth of 3,676 ft. Same operators' 1 Lanterman, NW NW NW 23-22-12, opened West Heyen pool last September with depthograph potential of 1,842 bbl. from Arbuckle.

Potentials have been given two pool-openers completed by Ed H. Adair in Rice and Marion counties. Adair and El Dorado Refining Co. 1 Chamberlain, NW NW NE 18-19-10, 1 mile southeast of Rick pool, Rice County, has been completed with 376 bbl. potential from Arbuckle. Test topped pay at 3,334 ft. and reached total depth of 3,337 ft. Adair's other pool-opener is 1 Jensen, SW SW NE 27-22-4e, Marion County, 1½ miles south of Peabody pool, which is rated at 100 bbl. daily from Mississippi. Pay was topped at 2,439 ft. and hole bottomed at 2,448 ft.

Two rank wildcats in the state are of interest. Hole is being made at A. G. Hill and Harbar Drilling Co. 1 Wooleridge, SW NW NE 19-27-7, 17 miles east of Cunningham pool, northern Kingman County. In Lane County, location has been staked for H. E. Alexander 1 Cooley, CSL NW SW 8-16-30, 34 miles west of nearest production in Arnold pool, Ness County. Test is on farm-out from National Cooperative Refinery Association which has a 6,000-acre block.

A fairly light week was registered in over-all activity with 49 locations annouced and 45 completions.

KANSAS SUCCESSFUL WILDCATS

Barton County: R. L. Williams 1 Ehly, SE SE NW 9-18s-11w, pumped 173 bbl. of 46°-gravity oil per day from Arbuckle at 3,314-18 ft.; anhydrite 590 ft., Lansing-Kansas City 3,022 ft., TD 3,318 ft.

Marion County: E. H. Adair 1 Jensen, SW SW NE 27-22s-4e, pumped 100 bbl. of 34°-gravity oil per day from Mississippian at 2,442-48 ft.; cherty conglomerate 2,425 ft., TD 2,448 ft.

Rice County: E. H. Adair and El Dorado Refining 1 Chamberlain, NW NW NE 18-19s-10w, pumped 376 bbl. of oil per day from Arbuckle at 3,335-39 ft.; anhydrite 525 ft., Heebner 2,882 ft., Lansing-Kansas City 3,006 ft., TD 3,339 ft.

KANSAS WILDCAT FAILURES

Greenwood County: Tom Palmer 1 Cunningham, NE NE NW 28-27s-11e, dry, TD 2,220 ft., Mississippian 1,997 ft.

Woodson County: E. E. Kilby 1 Curtis, SW NW NW 14-24s-15e, dry, TD 1,615 ft., Bartlesville 1,373 ft., Mississippian 1,542 ft.

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CANADIAN FIELDS

Coring Tests Indicate Possible Leduc Extension

CHATHAM. — A possible northwesterly extension of the Leduc field is indicated by Imperial-Woodbend 1, LSD 5, 15-51-26w4, 3½ miles northwest of the most northerly Leduc producer and 7 miles north of the most southerly. The well got initial indications in the D-1 zone, indicating a gas flow of 200,000 cu. ft. daily at 4,593-4,612 ft. followed by a 1,080-ft. rise of fluid in 35 minutes, being 450 ft. of heavy crude and 630 ft. of salt water. The well was coring below 4,914 ft. on top of the D-2 horizon of the Devonian limestone.

In the Leduc field, Imperial 21, LSD 11, 26-50-26w4, finished at 5,314 ft., has run casing to 5,278 ft. and is testing. Imperial 22, LSD 2, 26-50-26w4, has cored into likely production and run casing to 5,330 ft. Imperial 20, LSD 8, 34-50-26w4, finished at 5,295 ft., has swabbed into production, with initial flow of 900 bbl. in 16 hours. Five other Imperial tests are drilling, four near the producing horizons. Imperial 29 has location in LSD 7, 34-50-26w4, and Imperial 30 in LSD 4, 26-50-26w4. Home-Leduc 1, LSD 11, 21-50-26w4, finished in the D-3 zone at 5,345 ft., has run production string and is drilling in, with good well indicated. Rig will be skidded 26 ft. for Home-Leduc 2, which is planned to take production from the D-2 zone, proven in the earlier well.

Leduc allowables.—A temporary agreement regarding quotas for Leduc producers has been arranged between the Alberta Oil and Gas Conservation Board, the Western Canada Petroleum Association and the Leduc producers. The original order, limiting D-2 producers to 100 bbl. and D-3 producers to 150 bbl., has been restored for a 60-day period, during which the conservation board will make tests to establish a basis for permanent quotas. In case it is found impossible during the 60-day period to operate any well efficiently at the quota rate, the board will vary the order in such manner as to permit maximium efficiency.

Turner Valley.—In the Turner Valley north extension, Home Oil has three wells testing production, with one drilling. Home-Millarville 29, LSD 2, 33-20-3w5, with Madison limestone at 7,670-8,374 ft., is producing around 225 bbl. after developing 450 bbl. flush with acidization. Home-Millarville 27, LSD 16, 18-21-3w5, finished in Madison limestone at 8,981 ft., is testing. Home-Millarville 28, LSD 10, 18-21-3w5, is testing Madison at 8,455-8,899 ft.

Pipestone Creek.—In the Pipestone Creek area, south and east of the Leduc field, the important joint exploratory test by Ashley Gold & Minerals and McColl-Frontenac Oil Co. in LSD 2, 16-47-25w4, entered the D-1 zone of the Devonian limestone at 4,780 ft. and is coring below 4,926 ft. Coring and testing of the D-2 and D-3 zones will be continued to about 5,600 ft.

Ram River.—In the central Alberta foothills, Ram River Oils 3, LSD 12, 1-37-11w5,

bottoming at 5,784 ft., is redrilling for straight hole below 4,654 ft. and expected to get the oil horizon of the Devonian limestone around 4,750 ft. Ram River 2 had a small production of light crude in this horizon.

British Columbia.—Application has been made by Sydney A. Annand of Calgary and Garson C. Mitchell of Vancouver for a petroleum and natural gas permit covering 14,400 acres in northeastern British Columbia adjoining the Monkman Road. Petroleum and natural gas indications, the latter very extensive, have been discovered along the Monkman Road, and plans for development work are being made.

Gaspe.—In the Gaspe Peninsula of Quebec, Venture 2 well, drilled by Gaspe Oil Ventures, Ltd., of Montreal, contacted the limestone formation at 2,010 ft. and encountered gas showings at 2,040 ft. The major oil horizon was established to lie between 355 and 550 ft. in the limestone. On the Bald Mountain anticline, Imperial-Gaspe 1 is below 1,745 ft. with the petroliferous coral reefs at the base of the Silurian formation expected slightly below 1,800 ft.

APPALACHIAN FIELD

Wood County Test Goes Past Dry Oriskany

PITTSBURGH.—In Steele district, Wood County, West Virginia, United Fuel Gas Co. drilled through the Oriskany sand in the wildcat on M. A. Webber farm and it was dry. From an elevation of 818 ft., the Oriskany was logged at 4,613-61 ft. and the tools are now at 4,678 ft.

In Elk district, Kanawha County, United Fuel Gas Co. topped the Corniferous lime at 5,319 ft. from an elevation of 1,045 ft. in the test No. 6,239 Payne Gallatin Mining Co., and at 4,980 ft. from a surface elevation of 789 ft. in the test No. 6,242 W. J. Patterson.

In Oceana district, Wyoming County, Hope Natural Gas Co. completed a good Big lime gas well in the 9,156 M. D. Cook with the Big lime logged at 2,303-2,634 ft., and gas at 2,387-2,556-2,596 ft., acidized

New locations in the state totaled 18; in Otter district, Braxton County; Grant district, Doddridge County; DeKalb district, Gilmer County; Ravenwood district, Jackson County; Cabin Creek and Poca districts, Kanawha County; Clay district, Ritchie County; Buckhannon district, Upshur County; Lincoln and Stonewall districts, Wayne County; Baileysville and Oceana districts, Wyoming County..

There was only one new location in southwest Pennsylvania, in Morgan Township, Greene County.

SOUTHWEST PENNSYLVANIA SUCCESSFUL WILDCAT

Washington County, Allen Township: Pittsburgh Steel Co. 1 fee, 219,000 cu. ft. gas, lower Thirty Foot sand 2,039 ft., gas 2,047 ft., TD 2,075 ft.

WEST VIRGINIA SUCCESSFUL WILDCAT

Wyoming County, Oceana district: Hope Natural Gas Co. 9,156 M. D. Cook, 2,055,000 cu. ft. gas after acidizing, Big lime 2,303-2,634 ft., gas 2,387 ft., 2,556 ft., and 2,586 ft., rock pressure 770 psi. 30 hours, TD 2,725 ft.

WEST VIRGINIA WILDCAT FAILURES

Jackson County, Ripley district: Columbian Carbon Co. 968 V. J. Lathey, dry, elev 691 ft., Corniferous lime 4,741 ft., Oriskany 4,838 ft., 15,000 cu. ft. gas at 4,881 ft., TD 4,933 ft.

Columbian Carbon Co. 971 G. B. Jordan, dry, elev. 662 ft., Corniferous lime 4,679 ft., Oriskany 5,100 ft., show of gas 4,788 ft., TD 4,860 ft.

Kanawha County, Poca district: Evelyn Wade 1 J. W. Olive, dry, Big lime, TD 1,537 ft.

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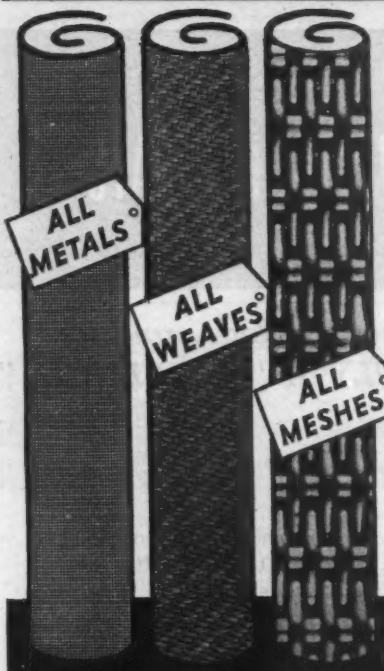

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OKLAHOMA

Suntex May Extend South Davenport Prue Sand Pool

SUNTEX DRILLING CO. set casing on top of Prue sand at its 1-A Chapman, SE SW SE 10-14n-5e, Lincoln County, which may indicate a ½-mile northeast extension to South Davenport Prue sand pool. Prue sand was cut at 3,360 ft. and total depth is 3,402 ft.

C. S. Phillips et al 1 Lloyd Hall, wildcat in NE NE SE 9-25n-7w, Grant County, flowed 50 bbl. per day of distillate through 250 ft. of cavings in hole. Test gaged 1,000 M.c.f. of gas daily.

A. G. Oliphant 1, NW NW NW 13-25n-5e, Osage County, north of Remington, has hit pay in Mississippi lime and chat. After finding pay at 2,982 ft., hole filled with 1,700 ft. of oil.

Casing is to be set in Mid-Continent Petroleum Corp. 1 Berry Estate, deep wildcat in NW SW SW 32-9n-3w, McClain County, 5 miles west of Norman. Mid-Continent ran electric log to total depth of 9,850 ft. and may test Simpson. Well had good show of oil in Bois d'Arc section of Hunton lime at 8,801-46 ft.

Gulf Oil Corp. 1 Cora Miley, NW NW NW 31-13n-2w, southwest offset to discovery well, Witcher pool, Oklahoma County, flowed 879 bbl. in 8 hours through ¾-in. choke on test of Hunton lime. Hunton was cut at 6,297 ft. and total depth is 6,362 ft. with casing at 6,307 ft.

Coring continues at Stanolind Oil & Gas Co. 1 Briscoe Unit, deep Grady County wildcat in C NW SE 4-4n-5w. Two cores between 14,148 and 14,188 ft. were hard and tight with only streaks of porosity and odor.

Cotton, Seminole, and Stephens counties dominated the picture in a very heavy week for new locations. Of the state's total of 99, these counties registered 39 locations. Same counties were among top five in completions, accounting for 28 of state's total of 74.

OKLAHOMA SUCCESSFUL WILDCATS

Cotton County: Kingery 2 Starr, NE SW NW 8-3s-11w, pumped 20 bbl. of 35°-gravity oil per day from sand at 1,601-12 ft., TD 1,612 ft.

Creek County: Martin 1 Douglas, SW NE NE 7-15n-10e, pumped 50 bbl. of 40°-gravity oil per day from Misener at 3,265-70 ft., TD 3,270 ft.

McClain County: Morgan 1 Hunter, NE NE SE 30-5n-3w, flowed 301 bbl. of 40.7°-gravity oil per day from Viola and first Bromide sand at 9,284-9,980 ft., TD 10,171 ft.

Pontotoc County: Belgan 2 Britt, NE SW SW 20-4n-7e, gaged 57,000,000 cu. ft. of gas from Gilcrease sand at 1,482-92 ft., TD 1,492 ft.

OKLAHOMA WILDCAT FAILURES

Cotton County: Kingery 1 Pickett, NW NW NW 20-2s-1ow, dry, TD 2,515 ft., no tops reported.

Taylor 1 Spencer, SE NE NW 23-2s-11w, dry, TD 1,900 ft., no tops reported.

Jackson 1 Merrwether, NE NE SE 26-2s-11w, dry, TD 2,004 ft., sand 1,885-91 ft. and 1,893-1,905 ft.

Cities Service 1 Butler, SW NE NW 20-3s-11w, dry, TD 2,020 ft., Megargle lime 2,001 ft.

Bridwell 1 O-Pah-Nah, SE NW SE 25-3s-11w, dry, TD 1,500 ft., sand 1,404-14 ft.

Garvin County: Double R 1 Scrivner, NE SW NE 30-3n-1e, dry, TD 4,340 ft., Basal Pennsylvanian - Viola 3,785 ft., Bromide dense 3,800 ft., first Bromide sand 3,960 ft., second Bromide sand 4,055 ft., McLish lime 4,189 ft., Basal McLish sand 4,216 ft.

Lincoln County: Allison 1 fee, NW SW SE 29-12n-3e, dry, TD 4,900 ft., Hogshooter 2,450 ft., oolite 3,560 ft., Checkerboard 3,790 ft., Red Fork 4,890 ft.

Delaney 1 Thompson, NE SW SE 22-13n-5e, dry, TD 5,100 ft., Mayes 4,530 ft.,

Woodford 4,775 ft., Misener 4,812 ft., Hunton 4,814 ft., Sylvan 4,884 ft., Viola 4,973 ft., dense 5,011 ft., dolomite 5,020 ft., first Wilcox 5,039 ft., second Wilcox 5,087 ft.

McClure 1 Dawson, NE NE SE 2-14n-4e, dry, TD 4,991 ft., Avant 2,250 ft., Hogshooter 2,610 ft., Checkerboard 2,954 ft., conglomerate 2,988 ft., Oswego 3,687 ft., Prue 3,732-88 ft., Red Fork 4,050 ft., Mayes 4,415 ft., Woodford 4,647 ft., Hunton 4,707 ft., Sylvan 4,778 ft., Viola 4,864 ft., first Wilcox 4,930-50 ft., second Wilcox 4,970 ft.

Davon 1 Patterson, SE SE SW 28-14n-4e, dry, TD 3,150 ft., conglomerate 3,095 ft.

Kingwood 1 Pentland, SE SW NE 2-16n-3e, dry, TD 4,702 ft., Hunton 4,480 ft., Sylvan 4,487 ft., Viola 4,578 ft., Wilcox 4,644-56 ft., second Wilcox 4,675 ft.

Noble County: Harper 1 Honeywell, SE SE NW 9-22n-2w, dry, TD 5,258 ft., Big lime 4,428 ft., Oswego 4,477 ft., Skinner sand 4,728-39 ft., no Bartlesville, Mississippi lime 4,870 ft., Woodford 5,095 ft., Viola 5,142 ft., Wilcox 5,211-36 ft.

Oklahoma County: Harper 1 McDaniel, C SW NW 18-14n-2w, dry, TD 5,968 ft., Oswego 5,674 ft., Bartlesville 5,927-49 ft., no shows.

Pawnee County: Mid-Continent 1 Diamond, NE SE NW 17-23n-3e, dry, TD 3,792 ft., Avant 2,258 ft., Layton 2,602 ft., Big lime 3,105 ft., Oswego 3,247 ft., Verdigris 3,522 ft., Skinner 3,529 ft., Red Fork 3,608 ft., Mississippi lime 3,779 ft. Pottawatomie County: Smith 1 Kytle, SW NE NW 36-8n-2e, dry, TD 5,490 ft.

Tillman County: Miller 1 Williams, NW NE SW 13-1n-17w, dry, TD 595 ft., sand 490-96 ft.

OHIO, KENTUCKY

Morgan County Test Finds Medina Oil

COLUMBUS.—Fred Beasley et al brought in a wildcat, a mile south of Malta, that filled up 1,000 ft. with oil in 24 hours from the Medina sand. The test, on Luther Tippie property, Section 15, Malta Township, Morgan County, reached the sand at 4,654 ft. and was drilled to 4,659 ft. Several wells in the township have reached the Medina sand, but none were productive and most were full of water. The nearest productive sand is 11 miles to the west in the Sayre gas pool. The oil is probably Pennsylvania Grade.

A third Newburg well was completed in Jackson Township, Knox County. Shuff and Bucy 1 A. L. Rine, Section 14, topped the sand at 2,515 ft., pay at 2,517-27 ft., and gaged 1,000,000 cu. ft. of gas natural. These wells were scheduled to reach the Clinton sand, about 300 ft. deeper.

A ¼-mile extension to the Sego pool was completed by the Clinton Oil Co. on W. A. Mauk property, Section 28, Madison Township, Perry County. Clinton sand at 3,292-3,349 ft. was shot and made 30 bbl. in 24 hours.

Another well in the Elyria pool was drilled in. Harry Dempsey et al on Catherine Basiak property, Section 3, Carlisle Township, Lorain County, found the Clinton at 2,289-95 ft. and gaged 1,192,000 cu. ft. natural, which is to be shot before tubing.

Seventeen countries reported a total of 35 new locations for the week. Lancaster field led in completions with 7 out of a total of 26.

OHIO WILDCAT FAILURES

Cuyahoga County, Royalton Township: Ohio Fuel Gas Co. 1 Ethel Schwartz, Section 6, dry, Clinton 3,061-3,125 ft., TD 3,175.

WESTERN KENTUCKY

OWENSBORO.—Ashland, Basin, and Yunker 1 Crafton, wildcat in 9-O-24, got 110 ft. of mud-cut oil on 1½-hour drill-stem test of Tar Springs at 1,662-92 ft.

Sun Oil Co. 1 Sarah Cox Keckley et al, wildcat in 5-L-26, recovered 1 ft. of oil and 239 ft. of salt water on 2-hour drill-stem test at 2,557-2,606 ft.

INDIANA

EVANSVILLE.—George S. Engle and Indiana Farm Bureau 1 A. C. Helfrich, NE SW SE 18-6s-11w, wildcat 3 miles west of Evansville, Vanderburgh County, has found excellent oil saturation in Waltersburg sand at 1,860-76 ft. One-hour drill-stem test got 660 ft. of oil and no water. Test is 2 miles from other production and on general trend between Heusler Dome and Evansville pools.

C. E. O'Neal & Co. and Fisher Oil Co. 1 W. L. Hanning, 1 mile northeast of Evansville pool in E8 NE NW 1-6s-11w, Vanderburgh County, got 5 ft. of oil and 25 ft. of oil-cut mud on 1½-hour drill-stem test of Pennsylvania sand at 890-98 ft.

Cecil E. Tedrow 1 C. W. Seibert et al, SE SE NW 10-6s-11w, Vanderburgh County, may extend Evansville pool ½ mile southwest. Test found 7 ft. of excellent saturation in Pennsylvania at 1,001-08 ft.

ROCKY MOUNTAIN

Texas Company Has Two Promising Wildcats

DENVER,—Two important wildcats of the Texas Co., one on the Adon structure, Campbell County, Wyoming, and the other on the Ragged Point structure, Musselshell County, Montana, are at a critical stage, and it probably will be known before the end of the year whether they will be discoveries. The Adon test, which is out in the center of the Powder River basin, in the 1 Unit, C NW NE 2-52n-72w, has plugged back from a total depth of 9,945 ft., and has begun testing. The 7-in. casing was cemented at 9,090 ft., and in a drill-stem test at 9,090-4,345 ft., open 3 hours,

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recovered 7,300 ft. of sulphur water. The formation was not identified, but probably is the Leo sand of Pennsylvanian age. This section, which showed nothing of importance on the way down, will be cemented off and casing perforated opposite the Converse sand. This is the sand which last October showed 2,000 ft. of oil, 3,100 ft. of salt water, and 170 ft. of mud on a drill-stem test at 9,006-17' ft. in 1 hour. The top of the sand was at 8,997 ft., and first few feet of cores showed saturation with 31°-gravity black oil, but the drill-stem test recovered oil of 27.4°-gravity. The Madison lime, which was topped at 9,765 ft., showed fresh water. The elevation is 4,385 ft. KB. The well is on a seismograph high and depth to the sands was much less than at first indicated.

The other wildcat is Texas Co. 1 Manion, SE SW SE 5-11n-30e, Ragged Point structure, in Montana, a test to the Cambrian. It had the top of that formation at 6,276 ft., and drilled to 6,312 ft. It had the top of the Kibby sand in the Quadrant formation of Mississippian age at 4,400 ft., and is reported to have recovered 750 ft. of oil in a drill-stem test at 4,400-60 ft. on the way down. No important shows were reported below that horizon. The 7-in. casing was set at 4,380 ft., and hole plugged back to 4,672 ft. It has begun swabbing to test. The Madison was at 5,200 ft. The anticline lies in Musselshell and Rosebud counties, and Ragged Point is one of three highs. The block comprises around 10,000 acres.

New pool at Rattlesnake.—Continental Oil Co. has opened a new shallow pool on the Rattlesnake structure, but in a separate fault block, San Juan County, New Mexico, in 119 Rattlesnake, NW SE SE 13-29n-19w. It was drilled to 890 ft., plugged back to 840 ft., and completed in the Dakota, flowing 30 bbl. per day of 66°-gravity oil. Top of Dakota was at 783 ft. A series of dry holes along the south line of Section 12 on the north, and in the NW Section 13 marked the limits of the field proper. In 1941, the company purchased at auction a block of 3,720 acres adjoining the field on the south, but separated from it by faulting. A deep test resulted in a gas discovery which showed a high helium content. It was taken over by the Government, and Continental drilled a second deep well under contract. Under a recent settlement, the Government retained all rights to the deeper sands, but restored to Continental the lease on the shallow horizons.

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Southeast Elk Basin.—Carter Oil Co. 8 Johnson-Watson, NE SE SW 8-57n-99w, ¾ mile south of the nearest Tensleep producer in Elk Basin, and in a fault block on the southeast side of the field, is drilling ahead at 6,314 ft. It is currently in the Amsden formation and headed for the Madison lime. So far it has shown saturation in the Embar, Tensleep and Amsden, and no water has been reported. Top of Amsden was approximately at 6,112 ft.; top of Tensleep, 5,927 ft. A drill-stem test at 5,923-64 ft. recovered 1,500 ft. of oil and 135 ft. of oil-cut mud in 1 hour, through ⅜-in. choke. Four other tests in the Tensleep showed oil, the best being 1,800 ft. of oil and 100 ft. of oil and gas-cut mud at 6,061-86 ft. The well is in the unit, but outside the participating area. Carter has extensive holdings between Elk Basin and South Elk Basin, and will drill additiona wells to test the productive area. This well is only 1½ miles north of nearest Tensleep producer in South Elk Basin.

Maudlin Gulch discovery.—Frontier Refining Co. 1 Unit, NE NW NW 35-4n-95w, Maudlin Gulch, Moffat County, Colorado, 7 miles northwest of the Wilson Creek field in Rio Branco County, which was temporarily abandoned 2 years ago after finding water in the Dakota and Sundance sands, has been made into a discovery in the Morrison formation after being worked over under an agreement with the Texas Co. Top of the Morrison was at 6,054 ft.; top of Sundance sand, 6,284 ft. After progressively perforating, testing and squeezing, promising saturation was encountered through perforations at 6,061-75 ft., 6,081-91 ft. and 6,205-29 ft. It swabbed 34 bbl. of oil and 50 bbl. of water per day. On a month's pumping test it made 70 bbl. of oil and 20 bbl. of water per day, with percentage of oil showing a steady increase. The unit contains 6,721 acres. Texas Co. has an option on a one-half interest, and probably will drill another well before exercising same.

Big Medicine Bow deep test.—Ohio Oil Co. and California Co., joint operators of the Big Medicine Bow field, Carbon County, Wyoming, have started a deep test to the Tensleep and possibly the Madison in 6 Kyle, NE SE NW 26-21n-79w. The location is ½ mile due west of the discovery well in the Sundance sand which created something of a sensation in 1935 when it came in at 5,393 ft. making 275 bbl. of 63°-gravity oil first hour, and 6,360 bbl. of oil with 81,000,000 cu. ft. of gas first 24 hours through 3-in. tubing. The new well is a west offset to the only Tensleep test drilled in the field which had water in the sand at 7,008-38 ft. and was abandoned at 7,854 ft. in granite. The formation showed dips of 20 degrees. No Madison was found in this test.

New operations.—New operations were down to 10, of which 1 was in the Rangely field in Colorado; 3 in the Ant Hills area in Niobrara County, and 1 at Circle Ridge, in Wyoming; 2 in Pondera, 1 each in Cedar Creek and Kevin-Sunburst, and one wildcat in Montana. The latter is A. B. Chase 1 Rukavina, C SW SE 10-6s-24e, Bluewater area, Carbon County. It is rigging up cable tools.

COLORADO SUCCESSFUL WILDCAT

Maudlin Gulch, Moffat County: Frontier Refining Co. 1 Unit, NE NW NW 35-4n-95w, TD 6,350 ft., old well worked over and completed as a discovery in Morrison sand for 70 bbl. of 35°-gravity oil and 20 bbl. of water through perforations at 6,061-6,229 ft.

COLORADO WILDCAT FAILURE

East Pritchett, Baca County: California Co. 1 Spiker, C SW NE 13-31s-48w, dry, TD 6,241 ft., Dakota 110 ft., Triassic 725 ft., Permian 1,035 ft., Lansing-Kansas City 3,906 ft., Viola 6,015 ft., Arbuckle 6,123 ft., elev. 4,653 ft. DF.

WILDCAT FAILURE IN WYOMING

Gothberg, Natrona County: Cities Service Oil Co. 1 Government, NW NE SW 22-36n-82w, TD 5,129 ft., dry, First Frontier 1,390 ft., Lakota 2,768 ft., Morrison 2,830 ft., Chugwater 3,505 ft., Tensleep 4,531 ft., elev. 5,588 ft., ground.

WILDCAT FAILURES IN MONTANA

Northeast of Hardin, Treasure County: H. L. Hunt 2 Kendrick Cattle Co., C NW NW 19-3n-22e, TD 7,488 ft., dry, Dakota 5,176 ft., Charles 6,610 ft., Madison 7,010 ft.

South Cherry Ridge, Blaine County: Nickerson & Nickerson 1 Wingert, C SW NW 2-34n-22e, TD 4,811 ft., show oil and gas at 4,408-25 ft., probably in Sunburst sand, dry.

Joplin area, Liberty County: Union Oil Co. 1 State, C SW 16-35n-7e, TD 3,302 ft., dry, tops not released, third of series of exploratory wells on 200,000-acre block.

NORTHWEST NEW MEXICO SUCCESSFUL WILDCAT

Rattlesnake, San Juan County: Continental Oil Co. 119 Rattlesnake, NW SE SE 13-29n-19w, TD 890 ft., PB to 840 ft., completed in Dakota, flowing 30 bbl. 66°-gravity oil in 24 hours, top of Dakota 790 ft. Discovery in fault block on Rattlesnake structure.

LA.-ARK.

Exploration Work Continues Steady

SHREVEPORT.—Exploration work continued at a comparatively high pace in northern Louisiana throughout the week, with progress reported from a number of tests, but no important shows of oil had been found on last report. In De-Soto Parish, operators at Skelly Oil Co. 1 Nash, 20-12n-16w, were erecting two 500-bbl. storage tanks for completion tests in the lower Pettit. Interest in development work centered around the extensive Ora field of Union Parish, which early this week passed the 100 mark in number of producers. Discovered just 6 months ago, this field is now considered the second largest in northern Louisiana.

In Bienville Parish, R. H. Crow et al 1 Sutton, 18-17n-6w, was drilling below 6,753 ft. It cored 2 ft. of porous gray limestone, with no shows, at 6,222-29 ft. Sample tops, with elevation of 334 ft., were: Nacatoch 2,170 ft., porbable base Annona 2,635 ft., Tuscaloosa 3,710 ft., Paluxy 3,970 ft., Massive anhydrite 5,320-5,590 ft. In Section 19-17n-5w, C. H. Murphy et al 1 Pipes was drilling in the Travis Peak at 7,138 ft. Union Producing Co. and Pure Oil Co., in reworking the 1 Nebo Oil Co., 30-14n-5w, were washing down at 6,069 ft.

In Natchitoches Parish, Continental Oil Co. 1 Pardee Co., 30-12n-6w, was drilling below 3,760 ft. It logged the Midway at 1,282 ft., and had sample top on the Nacatoch at 2,030 ft., on an elevation of 231 ft. In 11-8n-8w, H. C. Cockburn 1 L.L.L.L. apparently had squeezed the last perforations between 6,559-61 ft. without testing, and drilled out to 6,563 ft. to reperforate.

Carter Oil Co. 1 Matthews, 22-18n-4w, was drilling below 3,057 ft. after setting casing to 2,487 ft. Electric log was run, placing the Wilcox at 1,112 ft., Midway 1,657 ft., Cretaceous 2,347 ft., and Nacatoch 2,375 ft. Elevation is 353 ft. No details were relased on 24 side-wall cores between 1,037-2,375 ft.

In Union County, Arkansas, Stanolind Oil & Gas Co. and Lion Oil Co. 1 Magnolia fee, 3-9s-14w, reported some shows of oil and gas. A drill-stem test between 3,303-35 ft., open 15 minutes, recovered 100 ft. of gas-cut mud, plus 1,850 ft. of salt water. Flowing bottom-hole pressure was 1,575 psi. It then cored on down to 3,592-97 ft., recovering ½ ft. of porous soft limestone having a show of oil, and 1 ft. of

porous sand with oil stains. A test between 3,590-97 ft., open 10 minutes, recovered 690 ft. of salt water, with no shows. Cores between 3,636-41 ft. recovered tan, fine-grained and slightly porous sand with a show of oil, but a test of that interval, open 10 minutes, made a good blow and again recovered 690 ft. of salt water. Bottom-hole pressure was 1,450 psi., rising to 1,625 psi. when shut in. Top on the James, by samples, was 3,055 ft., with elevation of 231 ft.

In Columbia County, Chicago Corp. 1 Chaffin, 29-18s-20w, was re-perforating at 3,043-47 ft. A previous drill-stem test at that interval, open 30 minutes, recovered 630 ft. of salt water, with no shows of oil or gas. Bottom-hole pressure was 400 psi. In 17-19s-22w, H. L. Hunt 1 Bodcaw was drilling below 4,257 ft. Hunt's 1 Kitchens, 18-15s-21w, was drilling below 4,378 ft. O'Meara et al 1 Moody, 12-16s-22w, was below 4,110 ft., and G. H. Vaughn 1 McCall estate, 30-17s-18w, 30-17s-18w, was drilling at 5,925 ft.

NORTH LOUISIANA WILDCAT FAILURES

Caddo Parish: Lyons and Prentiss 1 Muslow Oil Co., NW NW NW 12-19n-15w, dry, TD 5,405 ft., lime 5,145 ft. with pin points of oil.

East Carroll Parish: Union Producing Co. 1 A. J. A. O'Brien, SE NW SE 5-19n-11e, dry, TD 6,292 ft.

Union Parish: A. K. Kilpatrick 1 Carl Hollis, NE SE NE 32-23n-1w, dry, TD 3,153 ft., Saratoga 2,234 ft., Tokio 2,517 ft., Lewisville 2,731 ft., elev. 112 ft.

Taylor King Drilling Co. 1 Boone, NE SE NE 27-23n-1w, dry, TD 2,532 ft., Wilcox 1,134 ft., Midway 1,506 ft., Arkadelphia 2,005 ft., Nacatoch 2,160 ft., Saratoga 2,321 ft., Annona 2,368 ft., Tokio 2,494 ft.

ARKANSAS WILDCAT FAILURES

Columbia County: Chicago Corp. 1 Chaffin, SE SE 29-18s-20w, dry, TD 9,160 ft.

Nevada County: V. S. Parkham 1 H. B. Cassady, SE SE 13-14s-23w, dry, TD 4,006 ft., Arkadelphia 870 ft., Annona 1,560-1,674 ft., Tokio 2,068 ft., Paluxy 2,223 ft., Upper Glen Rose 2,294 ft., Massive 2,585-2,710 ft., James 3,157 ft., Pettit 3,355 ft., Travis Peak 3,444 ft., elev. 326 ft.

Union County: Curtis Kinard 1 Anthony Lumber Co., SW SE 34-16s-14w, dry, TD 5,954 ft., Wilcox 1,160 ft., Midway 1,490 ft., Arkadelphia 2,095 ft., Nacatoch 2,260 ft., Cotton Valley 3,930 ft., Buckner 5,740 ft., elev. 175 ft.

ILLINOIS

Phillips Wayne County Wildcat Hits McClosky Pay

MATTOON.—Phillips Petroleum Co. 1 Book, wildcat 5 miles south of Fairfield in NW SE SW 31-2s-8e, Wayne County, made 175 bbl. of oil and 25 bbl. of water on 24-hour test of McClosky lime at 3,375-85 ft. Test is one mile from other production.

J. H. and C. H. Gilliam 1 Dick Slemaker, SW SW NW 6-5s-10e, ¾-mile south extension to Maunie pool, White County, has been completed for 114 bbl. daily. Production is from McClosky at 3,033-39 ft. and total depth is 3,125 ft.

Clay County led the state in completions for week with 8 of state's total of 44. Other leaders were Edwards, Gallatin, Richland, Wabash, and Wayne. Considerable activity may be forecast for Wayne County where 17 drilling permits were granted for the week. Wabash, Richland, and White were also high in drilling permits with 9, 6, and 6 respectively of state's total of 67.

ILLINOIS SUCCESSFUL WILDCATS

Crawford County: Ohio 1 McKee, SE NE NW 29-7n-13w, IP 138 bbl. daily from Salem, TD 2,935 ft., PBTD 1,816 ft.

White County: Heath 1 Austin, SW SE NW 32-6s-9e, IP 66 bbl. daily from Degonia, TD 2,506 ft., PBTD 2,050 ft.

ILLINOIS WILDCAT FAILURES

Clark County: Kucykendall 2 Hammond

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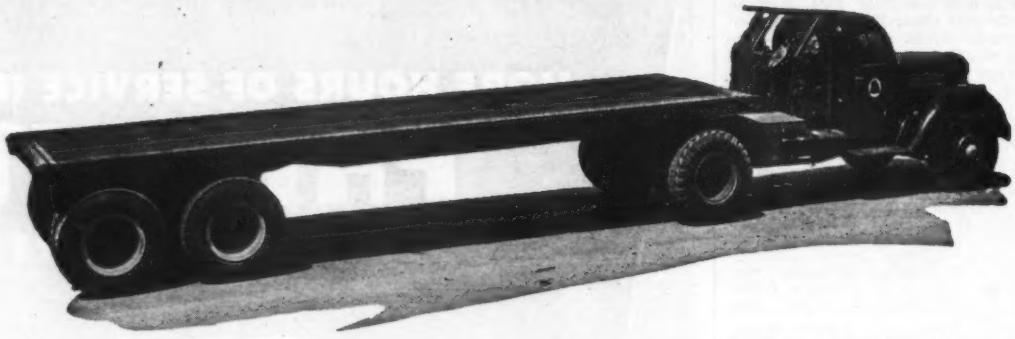

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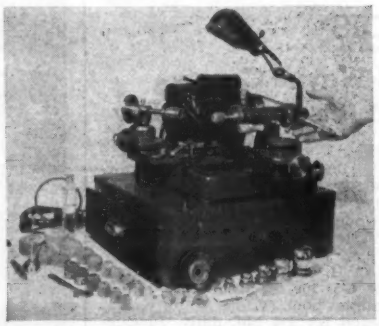

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Wayne County: National Associated 1 Hammock, NE NW NE 27-2n-5e, dry, TD 3,043 ft.

PERMIAN BASIN

Jordan Ellenburger Field Gets Third Pay Zone

MIDLAND.—A third pay zone for the Jordan Ellenburger field of southern Ector County was assured this week when Gulf Oil Corp. 20-E-B W. E. Connell, 1 mile north and slightly west of Gulf's 1-E-A Fogelson-University, Ellenburger discovery, flowed 175 bbl. of 44.7°-gravity oil in 2 hours on a drill-stem test. The test was made in the middle Ordovician, from 8,634-35 ft., in a sand below the regular Waddell zone of the Simpson. When the tool was opened, gas came to the surface in 3 minutes, flowing at an estimated rate just under 2,000,000 cu. ft. a day. Oil started flowing at the end of 8 minutes and was allowed to clean into pits for a short time before being turned into storage. There was no water with the oil. It was deepened to 8,771 ft. for another drill-stem test.

Early in the week, Magnolia Petroleum Co. 6-DD-B E. P. Cowden, ½ mile south of Ellenburger production in the Dollar Hide field of southwest Andrews County, flowed 90 bbl. of 45°-gravity oil on a 3-hour drill-stem test in the top of the Ellenburger section at 9,887-9,931 ft. When the tool was opened, oil came to the surface in 61 minutes, flowing for 1½ hours into tanks, with a gas-oil ratio of 405 cu. ft. It is the third well in the area and is said to be running higher on the Ellenburger than the other two. Tentative top on the Ellenburger was placed at 9,890 ft., on an elevation of 3,157 ft. On last report operators were running electric survey at 10,003 ft., total depth.

Sun Oil Co. 1 J. B. Walker, Coke County wildcat 4 miles south-southwest of the Jameson Strawn field, reported a trace of oil in samples from the Strawn, topped at 6,123 ft., but a drill-stem test between 6,123-40 ft. failed when the testing tool opened prematurely. A second test between 6,135-75 ft. recovered mud with no shows. Operators were drilling ahead below 6,225 ft. in limestone not yet identified as the crinoidal zone of the Jameson field.

Stanolind Oil & Gas Co. 1 M. J. Hall, first commercial producer in Cochran County below the San Andres, made completion potential this week of 321 bbl. of 39°-gravity oil a day, flowing natural through 12/64-in. tubing choke. Production is from open hole, between bottom of casing at 10,378 ft., and plugged-back total depth of 10,541 ft., in the Strawn of the Pennsylvanian. Location is 15 miles south of Lehman, Section 13, Block L, PSL survey, and adjacent to several small wells which produce from the San Andres around 5,100 ft. Nearest deep production to the discovery is the Irish field of southwest Hale County, some 75 miles to the northeast.

Skelly Oil Co. 1 Alma Thomas, Section 14, Block 46, T&P survey, southeast extension to Wheeler Devonian area, topped the Devonian at 8,395 ft., on a derrick-floor elevation of 3,119 ft., and ran a 3-hour drill-stem test between 8,405-63 ft. Gas came to the surface in 16 minutes, followed by the 1,000-ft. water blanket in 45 minutes, and oil at the end of 60 minutes. On the first hour, flowing into tanks, it made 28.2 bbl. of oil and 25.1 bbl. the second hour. The oil tested 38.8° gravity, and was cut less than 1 per cent with basic sediment.

Five miles west of the Wheeler field, Magnolia Petroleum Co. 1 R. A. Wheeler, Section 13, Block 40, PSL survey, was apparently a failure in the Devonian, as well as the Silurian and Ellenburger. It swabbed 7 bbl. of salt water in 20 hours of swabbing, after a 2,000-gal. acid treatment through perforations at 9,400-50 ft.

WEST TEXAS SUCCESSFUL WILDCATS

Hockley County: Stanolind Oil & Gas Co. 1 F. F. Bozeman, Labor 11, League 43, Rains CSL Sur., 1½ mi. NE Slaughter field, flowed 262 bbl. 29°-gravity oil per day, ¾-in. choke, GOR 350 cu. ft., casing pressure 700 psi., tubing pressure 790-0 psi., lower Permian pay 4,796 ft., TD 4,889.
Crockett County: Plymouth Oil Co. 1-O-A J. W. Owens, Sec. 6, Blk. GG, H&OB Sur., 1½ mi. S Olson field, dry, TD 6,270 ft., PB to 2,000 ft. and completed as small gas well in Soma sand, top pay 1,085 ft., gaged 505,000 cu. ft. gas a day through open 2-in. perforated casing 1,085-1,100 ft.

WEST TEXAS WILDCAT FAILURES

Crosby County: McDaniel & Beecherl & Anderson Bros. 1 Betty Ammons, Sec. 1,146, BS&F Sur., 3½ mi. from S and 2½ mi. from E line of county, dry, TD 4,570 ft., anhydrite 500 ft., Yates 1,230 ft., San Andres 2,200 ft., Clear Fork 3,560 ft., Tubb 4,234 ft., elev. 2,686 ft.
Gaines County: DeKalb Agriculture Association 1 Northrup-Lindsey, Sec. 367, Blk. G, CCSD&AGNG Sur., 14 mi. W Seminole, dry, TD 7,318 ft., Yates 3,110 ft., Glorietta 6,010 ft., elev. 3,429 ft.
Hockley County: G. P. Livermore et al 1 W. E. Williamson, Labor 48, League 74, Haskell CSL Sur., 9 mi. NW Levelland, dry, TD 4,750 ft., anhydrite 2,020 ft., San Andres 3,670 ft., elev. 3,604 ft.
Lubbock County: Honolulu Oil Corp. 1 M. Rhoades, Sec. 8, Blk. E, GC&SF. Sur.,

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5 mi. S Lubbock, dry, TD 10,471 ft., San Andres 3,520 ft., Ellenburger 10,298 ft., elev. 3,216 ft.

Lynn County: Honolulu Oil Corp. 1 C. O. Edwards, Sec. 58, Georgetown RR Sur., 11 mi. W Tahoka, dry, TD 7,242 ft., anhydrite 2,160 ft., San Andres 4,090 ft., Glorietta 6,020 ft., elev. 3,174 ft.

Pecos County: Jergins Oil Co. 1 J. H. Eaton, Sec. 13, Blk. 2, H&TC Sur.,, 4½ mi. E Buena Vista, dry, TD 5,500 ft., Detrital 4,945 ft., Simpson 5,085 ft., Ellenburger 5,280 ft., elev. 2,369 ft.

Regan County: Continental Oil Co. 1 University B-16, Sec. 16, Blk. 48, University Lands, 2 mi. SW Barnhart field, dry, TD 3,641 ft., Yates 2,030 ft., lime 3,535 ft.

SOUTHEAST NEW MEXICO WILDCAT FAILURE

Lea County: Emperor Oil Co. 1 Ameranda-State, SW SW 20-21s-34e, dry, TD 4,184 ft., anhydrite 1,750 ft., salt 1,995 ft., Yates 4,028 ft., Cowden 3,630 ft., elev. 3,728 ft.

CALIFORNIA

Alondra Park Well Flows 750 Bbl. Daily

LOS ANGELES. — British - American Oil Producing Co. and The Texas Co. have added another excellent producer to the Alondra Park field of Los Angeles County with completion of their 1 Village Community, 22-3s-14w. On production test the well flowed at the rate of 750 bbl. daily from oil sand topped at 9,216 ft. Total depth of the well is 9,926 ft., and 7-in. casing is cemented at 9,206 ft.

Very few producers have been completed in the Alondra Park field since discovery nearly a year ago, and the percentage of dry holes has been high. This is due principally to a very complex system of faults in the area. However, the producers that have been completed here are very prolific, and the area will probably be developed into a large field once operators have gained sufficient knowledge of the reservoir conditions.

Seguro Petroleum's deep test in the old Huntington Beach field continues to attract considerable interest, and operators last week reported that 8 ft. of good oil sand had been cored from 6,232-40 ft. Known as the 1 Seguro, 34-5s-11w, the well currently is below known producing horizons in the field and may add a new zone. An electric log run during the past week is also reported to have shown encouraging results.

Standard of California has recovered all fish in its deep wildcat test in the Middle Dome area at Kettleman Hills with the exception of the sub and bit. These are expected to be recovered within a few days. Present plans of the company call for redrilling the well, the No. 53-30V, 30-23s-19e, on down to 12,205 ft. where a formation test is scheduled. The project has been showing considerable gas on the ditch during the past few days and operators are now using heavy mud which gives the well little chance to show much. Originally drilled to a depth of 12,389 ft., the well is believed to have scored an important Eocene strike. Operators were forced to back up and redrill, however, due to a fish which could not be recovered.

New locations in California fields remained at a high level during the past week as operators announced locations for 55 proposed new ventures. This was a decrease of only four from the number staked during the previous week. Kern River received the greatest number of proposed new tests with nine of the locations. South Belridge, Huntington Beach and Wilmington each received five new locations, while Kern Bluff received three.

CALIFORNIA WILDCAT FAILURES

Fresno County, Jacalitos area: Standard Oil Co. 21-6N Ferguson, 6-22s-16e, dry, elev. 1,226 ft., Santa Margarita 5,162 ft., Kreyenhagen 6,053 ft., Eocene 7,222 ft., Cretaceous 7,525 ft., TD 7,525 ft.

Kern County, Kern River area: St. Anthony Oil Corp. 1 Anthony, 18-28s-28e, dry, elev. 1,033 ft., Santa Margarita 1,628 ft., Olcese 2,365 ft., Jewett 3,080 ft., Vedder 4,052 ft., Silt 4,898 ft., Fomosa 5,070 ft., TD 5,657 ft.

North Belridge area: Belridge Oil Co. 63-30 Belridge, 30-27s-20e, dry, elev. 846 ft., TD 4,227 ft.

Strand area: Beloil Corp., Ltd. A-1 KCL-B, 18-30s-26e, dry, elev. 334 ft., Stevens 8,209 ft., TD 8,340 ft.

Round Mountain area: Loren L. Hillman 1 Bowhay-Portals, 5-29s-29e, dry, elev. 571 ft., Pyramid Hills 2,415 ft., Vedder 2,550 ft., TD 2,780 ft.

Wheeler Ridge area: Richfield Oil Corp. C-1 Wheeler Ridge-KCL, 20-11n-20w, dry, elev. 1,393 ft., TD 7,003 ft.

Los Angeles County, Lawndale area: Seaboard Oil Co. 51-20 Pauley-Seaboard, 20-3s-14w, dry, elev. 71 ft., TD 6,001 ft.

San Luis Obispo County, Templeton area: Miller & Nance 1 Cherry, 18-27s-11e, dry, elev. 1,100 ft., TD 1,002 ft.

Santa Barbara County, Cat Canyon area: General Petroleum Corp. 73-10 Realty, 10-9n-33w, dry, elev. unknown, TD 5,779 ft.

North Elwood area: Rice and Firestone 1 North Elwood Doty, 11-4n-29w, dry, elev. 130 ft., TD 3,611 ft.

Solano County, Kirby Hills area: Bishop Oil Co. 1 Bishop-Calveras-Triguerio, 5-3n-1e, dry, elev. 45 ft., TD 5,295 ft.

Ventura County, Montalvo area: The Texas Co. 1 J. V., 24-2n-23w, dry, elev. 25 ft., TD 12,051 ft.

Oxnard area: Signal Petroleum Co. 1 Schumate, 28-2n-21w, dry, elev. 375 ft., TD 2,733 ft.

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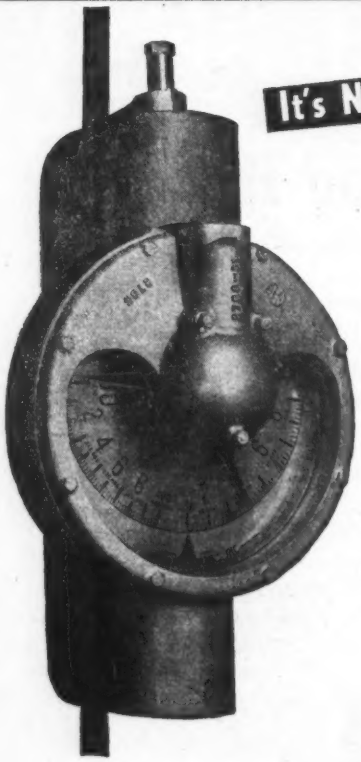

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Well Completions in November Up 15.6 Per Cent Over 1946

TOTAL well completions in November increased 15.6 per cent over November last year, a gain of 404 wells, for a total of 2,991. The increase was made up of 230 oil wells, 197 dry holes, partly offset by a decrease of 23 gas wells. Oil wells increased 17 per cent, dry holes 20.6 per cent, and gas wells decreased 7.5 per cent.

Total footage at 10.3 million feet as compared to 8.6 million feet in November last year, was up 20 per cent, which compares to a gain of only 15.6 per cent in well completions. This indicates a rising total depth trend, and the average depth of all wells drilled this November was 3,445 ft., an increase in depth of 131 ft. compared to average depth last year.

Increases were recorded in the number of wells in all depth classifications except in the 1,000-2,500-ft. group. The 2,500-5,000-ft. range showed the greatest gain, the November total of 1,396 wells completed representing an increase of 41 per cent, or 404 wells over last year.

The area comparison of completions this year with those of last November indicates that the Texas-New Mexico district produced the greatest percentage gain, as well as the largest numerical increase in completions. The total completions were 249 greater, an increase of 39 per cent. Oil producers were up 47 per cent, dry holes up 35 per cent.

The Arkansas-Louisiana-Mississippi-Alabama-Georgia-Florida area recorded a gain of 67 completions or 34 per cent over last year. The northeast central region, including Ohio-Indiana-Illinois-Kentucky, and Michigan, had a gain of 95 wells or 19 per cent. An increase of 15 completions in the Rocky Mountain area also represented a 19 per cent gain over last year. Completions in Kansas-Oklahoma were just 2 more than November last year, while in the eastern states of New York, Pennsylvania, and West Virginia, the total number dropped 27 wells or 6 per cent.

A regional comparison of rigs and drilling indicates that the totals by areas in November this year compared to last year were as follows: eastern states up 66, or 11 per cent; northeast central up 27, or 4 per cent; Kansas-Oklahoma up 79, or 9 per cent; Texas-New Mexico up 57, or 5 per cent; southern area down 2, or 0.6 per cent; Rocky Mountain up 92, or 44 per cent. California showed the tremendous drilling campaign now on out there with an increase of 125, or 58 per cent. For total United States the increase was 444, or 11 per cent over last year.

The seasonal trend toward fewer completions as winter comes on is reflected in the comparisons of November totals with those of October this year. The eastern states of New York, Pennsylvania, and West Virginia had a decrease of 160 wells, made up of 79 oil producers, 17 gassers, and 64 dry holes and service wells. The northeast central region of Ohio, Indiana, Kentucky, Michigan, and Illinois ran counter to the seasonal trend with a net gain of 41 wells over October. Kansas and Oklahoma had a drop of 214 completions or 30 per cent. Texas-New Mexico had a increase of 82 wells, or 10 per cent. The southern area of Arkansas, Louisiana, Mississippi, Alabama, Florida, Georgia dropped off two completions from a rather high level in October. In the Rocky Mountain area the trend was also counter seasonal, an increase of 18 wells representing a gain of 34 per cent over October. California was off 18 per cent, or 39 wells. For the United States total, the seasonal decrease was 274, or 8.5 per cent.

Imperial Raises Prices

Imperial Oil, Ltd., Toronto, has increased its crude oil postings by 50 cents per barrel, effective December 12, covering Western Ontario, Turner Valley, and Leduc-Calmar fields. This brings the price to $3.45 per barrel for all postings which previously were $2.95 per barrel.

SUMMARY OF COMPLETIONS, NOVEMBER 1947

	Comp.	Oil	Prod.	Gas	Dry	Under 1,000 ft.	1,000-2,500 ft.	2,500-5,000 ft.	5,000-10,000 ft.	Over 10,000 ft.	Total footage	Rigs and drilling
New York	101	51	107	0	[1]50	0	101	0	0	0	146,100	167
Pennsylvania	292	142	308	27	[2]123	0	0	292	0	0	457,223	260
West Virginia	65	7	42	45	13	1	32	27	5	0	189,083	262
Ohio	135	31	634	40	[3]64	19	46	70	0	0	356,877	236
Indiana	80	38	2,690	4	[4]38	22	58	0	0	0	117,313	84
Kentucky	80	30	1,426	10	40	24	40	16	0	0	125,551	91
Illinois	212	97	11,058	3	112	17	41	154	0	0	575,368	221
Michigan	93	28	7,158	8	[5]57	5	57	31	0	0	196,777	128
Kansas	233	102	46,654	55	[6]76	1	31	200	1	0	731,409	394
Neb., Mo., Iowa	0	0	0	0	0	0	0	0	0	0	0	11
Oklahoma	277	[7]142	15,502	16	[4]119	12	102	118	40	5	893,895	548
Texas	847	503	93,088	41	303	56	160	325	277	29	3,782,621	981
North	138	78	6,320	2	58	13	61	47	16	1	402,143	140
West Central	79	25	3,026	5	49	3	26	47	3	0	236,413	84
West	214	192	57,187	0	22	16	29	104	56	9	970,424	116
Panhandle	40	22	3,514	15	3	0	2	36	2	0	125,633	139
Eastern	63	[8]33	5,331	6	24	1	7	29	26	0	312,593	89
Gulf Coast	150	[9]84	10,394	6	60	9	3	28	97	13	965,926	213
Southwest	163	[10]69	7,316	7	87	14	32	34	77	6	769,489	200
Louisiana	180	107	13,810	12	61	0	78	17	49	36	997,026	231
Northern	95	[11]61	6,311	11	23	0	71	11	12	1	277,257	107
Southern	85	[12]46	7,499	1	38	0	7	6	37	35	719,769	124
Arkansas	37	[13]25	2,542	0	12	0	2	27	8	0	162,255	38
Mississippi	44	[14]30	8,400	0	14	0	0	4	24	16	354,142	71
Ala., Ga., Fla.	6	0	0	0	6	0	0	2	3	1	38,853	10
Montana	40	22	1,996	11	7	10	20	10	0	0	75,138	96
Wyoming	29	18	5,127	2	9	1	4	16	8	0	128,738	115
Colorado-Utah	24	18	3,305	0	6	2	1	2	19	0	133,757	92
New Mexico	42	28	4,980	8	6	3	8	23	8	0	153,920	140
California	174	135	27,162	1	38	10	48	62	48	6	687,487	340
Total November 1947	2,991	1,554	245,989	283	1,154	183	829	1,396	490	93	10,303,533	4,516
Total October 1947	3,265	1,760	302,355	339	1,166	141	967	1,629	465	63	10,772,599	4,718
Total November 1946	2,587	1,324	209,251	306	957	93	1,016	992	425	61	8,573,292	4,072

Service wells included: [1]41, [2]116, [3]9, [4]1, [5]15, [6]5. Distillate wells included: [7]1, [8]2, [9]6.

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Among the Drilling Contractors

Drilling Contractors, Ltd., Active in Leduc

Drilling Contractors, Ltd., Calgary, Alta., are handling considerable work in Leduc field, where they have recently completed the drilling of Imperial 17, 20 and 21, and are at present working on wells Nos. 23, 28, 29, and 30 for the same concern. The company is also completing Home-Leduc 1 in same field. In Turner Valley field, the company has finished the drilling of Home 27 and 28, both indicating good producers. In Wabamun Lake area of northern Alberta, same contractors are below 6,397 ft. on Wabamun 1, LSD 5, 10-51-4w5, joint test for Anglo-Canadian Oil Co., Home Oil, and Calgary & Edmonton Corp.

Kingery Drilling Two

Kingery Drilling Co., St. Joe, Tex., is interested in two southwestern Oklahoma wildcat tests in Tillman County, which are under way. Kingery holds contract on W. H. Spiers, Charles P. Abbott, and J. H. Sinex 1 Indian, SW NW NW 34-4s-15w, southwest of Grandfield, which is below 2,400 ft. on 4,100-ft. contract. Also southwest of Grandfield, Kingery is drilling its 1 Margaret Johnson, SW SE SW 2-5s-15w, on 2,500-ft. contract.

George & Wrather Busy

George & Wrather Drilling Co., Mount Carmel, Ill., is drilling H. A. Huskey 1 Schmidt, wildcat in 33-4s-10w, Vanderburgh County, Indiana. Same concern holds contract for two other Vanderburgh County wells. They are: Joe Reznik 1 Oscar M. Riggs, 330 ft. from south and west lines, SW NW SW 28-4s-10w, and Joe Reznik 1 Wilfred and Irma Schmidt, 330 ft. from north and east lines, NE NW NW 33-4s-10w.

Sam Tennant Drilling Co., Blackwell, Okla., is digging pits for a C. A. Leonard Estate well on Nix farm, SW SW NW 18-28n-1e, Kay County, Oklahoma.

Western Drilling Co., Dallas, has contract for a test well on a 23,000-acre block about 35 miles northeast of Santa Rosa, Guadalupe County, east-central New Mexico. Block was assembled by H. F. Hartwell, Arriba, Colo., and Harry S. Perry, Denver. Wildcat is 1 Monsimer, C 26-12n-23e, and will be drilled to granite or approximately 5,000 ft.

Calvert & Willis, Inc., Olney, Ill., are currently active on three wildcat wells of their own. These are: 1 C. Lipper, SE SW NE 35-5s-11w, Vanderburgh County, Indiana; 1 Arterbury-Coen, 330 ft. from south and west lines, NE SE NW 9-2n-10e, Richland County, Illinois; and B-1 Bemis, SE SW NE 8-3n-8e, Clay County, Illinois.

T. F. Hunter, Wichita Falls, is drilling Fain & McGaha 1 Claude Owens, wildcat in Section 111, T&NO Survey A-348, 1½ miles south of Maybelle, Baylor County, North Texas. Contract is for 4,300-ft. test and well is 2 miles northwest of production.

Ault Drilling Co., Holdenville, Okla., is drilling C. H. Peters 1 Hunter Young, wildcat in NE NE SW 16-3s-11e, southeast of Tuska, central Atoka County, Oklahoma. Test is on seismograph high and is contracted for 2,000 ft.

Delta Drilling Co., Shreveport, has staked its 1 Ruth Starr Blake, Nacogdoches University Survey, Hopkins County, East Texas. Test is first offset to company's sub-Clarksville discovery in Como sector.

White River Drilling Co. holds contract for N. A. Cummings 9 Fifer heirs, 330 ft. from south and 368 ft. from east lines, SE SE NE 35-3s-14w, Posey County, Indiana.

Jayhawk Drilling Co. is drilling Vickers Petroleum Co. 1 Carter, SW SE NE 21-31-10, wildcat 8 miles east of Whelan pool, Barber County, Kansas.

Big Chief Drilling Co., Oklahoma City, and Vaughey & Vaughey are rigging up for 2 Parker-Beach, Lot 131, 9-6n-2w, Adams County, Mississippi.

Spartan Drilling Co., Shreveport, is starting its 1 Alice Baker, C SW NW 13-17s-20w, Travis Peak test, Magnolia field, Columbia County, Arkansas.

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W. H. Black, Midland, Tex., will drill rank wildcat on 6,000-acre block in northwestern Lane County, Kansas, for H. E. Alexander. Test is 1 Cooley, CSL NW SW 8-16-30, 34 miles west of nearest production in Arnold pool, Ness County.

Penrod Drilling Co., Shreveport, has contract for Hunt Oil Co. 1 Grant Timber Manufacturing Co. 19-21n-9w, Cotton Valley field, Webster Parish, North Louisiana.

Rine Drilling Co., Wichita, and Drillers Gas Co. have started at 1 Dickerson, NE NE SW 27-31-15, wildcat ¾ mile east of Donald gas pool, Barber County, Kansas.

Harvey Drilling Co., Wichita Falls, has opened a shallow oil pool 7 miles northwest of Sanger, Denton County, Texas, with its 1 Wade, T. Carpenter Survey, which flowed 26 bbl. daily on test. Pay is from 1,644-68 ft.

Mercury Drilling Co., Tulsa, et al, are starting 1 Loomis, SW SW NE 14-22n-2w, Noble County, Oklahoma.

Keyes Drilling Co. has staked location for its 1 Meillies, SW SW SW 29-19-11, wildcat 1½ miles north of Silica pool and 1 mile west of North Ellinwood pool, Barton County, Kansas.

Glasscock Drilling Co., Shreveport, has contract for Travis Peak test for Caruthers & Marshall in Sugar Creek field, Claiborne Parish, North Louisiana. Test is 1 Bufkin-Wilson, 33-20n-5w.

Earl Wakefield, Wichita, holds contract for Russell Maguire 1 Clawson, NE NE SW 7-30-15, wildcat 3 miles northwest of Turkey Creek pool, Barber County, Kansas.

Lyons & Prentiss, Shreveport, hold contract for Sohio Petroleum Co. 2 Parker-D, Lot 138, 9-6n-2w, LaGrange field, Adams County, Mississippi.

Harbar Drilling Co., Wichita, and A. G. Hill are making hole at 1 Wooleridge, SW NW NE 19-27-7, rank wildcat 17 miles east of Cunningham pool, northern Kingman County, Kansas.

Aylward Drilling Co. will drill Consolidated Gas Co. and Anderson-Prichard Oil Corp. 1 Frantz, NE NE NE 35-30-2w, in abandoned Anson gas pool, 7 miles northwest of Wellington pool, Sumner County, Kansas.

Falcon-Seaboard Drilling Co., Tulsa, has started 5,000-ft. test, its 1 Gullinger, SW NE NE 29-29n-3w, Grant County, Oklahoma.

Bennett & Roberts Drilling Co., Inc., and Harry Gore are moving in tools for 1 Dodrill, SW SW SW 23-8-18, 1½ miles northwest of Dopita pool, Rooks County, Kansas.

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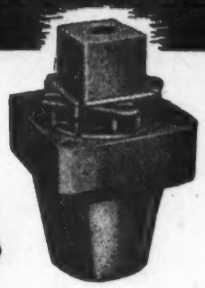

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I. H. GRANCELL
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LOS ANGELES 1, CALIFORN'A

STATISTICS and T

WEEKLY WELL COMPLETIONS . . . WEEK ENDED DECEMBER 20, 1947

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1947				
	Comp.	Oil	Gas	Dry	Footage	1947	1946	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	37	19	0	*18	37,064	1,711	1,537	0	0	0	0	0	3	0	0	2	5
Pennsylvania	61	30	5	†26	99,251	3,060	3,863	0	0	1	0	1	0	0	8	6	14
West Virginia	12	3	5	4	31,070	849	732	0	0	1	3	4	5	0	37	35	77
Ohio	29	5	10	‡14	84,315	1,339	1,249	0	0	0	1	1	0	0	8	43	51
Indiana	12	4	1	7	24,917	634	374	0	0	0	0	0	22	0	0	36	58
Kentucky	21	9	2	10	33,448	728	469	0	0	0	0	0	8	0	0	33	41
Illinois	38	20	1	17	97,848	2,043	2,262	2	0	0	4	6	62	0	1	352	415
Michigan	19	2	1	16	42,305	884	798	0	0	0	13	13	11	0	12	243	266
Kansas	45	19	12	§14	133,204	2,642	1,989	3	0	0	2	5	44	0	13	334	391
Neb., Mo., Iowa	0	0	0	0	0	5	19	0	0	0	0	0	0	0	0	5	5
Oklahoma	67	37	3	27	208,670	3,921	2,982	3	0	1	16	20	113	9	24	673	819
Texas	166	96	13	57	768,112	8,978	7,656	8	0	4	33	45	291	54	82	1,422	1,849
North Central (Dist. 7-B & 9)	42	18	2	22	122,741	2,785	2,667	2	0	2	10	14	82	1	13	473	569
West (Dist. 7-C & 8)	45	34	1	10	216,213	2,201	1,729	1	0	1	7	9	48	0	4	168	220
Panhandle (Dist. 10)	9	8	0	1	34,892	471	300	0	0	0	0	0	1	0	2	11	14
Eastern (Dist. 5 & 6)	9	8	0	1	51,274	564	675	1	0	0	1	2	11	2	5	121	139
Gulf Coast (Dist. 3)	32	16	8	8	186,852	1,522	1,698	0	0	1	5	6	64	38	35	280	417
Southwest (Dist. 1, 2 & 4)	29	12	2	15	156,140	1,435	587	4	0	0	10	14	85	13	23	369	490
Louisiana	46	31	5	10	197,992	1,585	1,376	0	0	0	5	5	39	24	9	208	280
Northern	31	20	4	7	79,479	945	782	0	0	0	4	4	3	3	3	128	137
Southern	15	11	1	3	118,513	640	594	0	0	0	1	1	36	21	6	80	143
Arkansas	11	6	0	5	42,986	321	179	0	0	0	3	3	2	1	0	62	65
Mississippi	13	8	0	5	115,003	478	258	0	0	0	1	1	2	0	1	89	92
Southeastern States	2	0	0	2	10,720	63	43	0	0	0	2	2	0	0	0	54	54
Montana	10	2	3	5	27,996	302	308	0	0	0	3	3	7	0	8	28	43
Wyoming	4	3	0	1	19,896	256	167	0	0	0	1	1	13	0	6	45	64
Colorado-Utah	2	1	0	1	12,591	205	164	1	0	0	1	2	3	0	3	48	54
New Mexico	15	13	0	2	63,214	531	395	0	0	0	1	1	6	0	1	40	47
California	59	44	0	15	269,061	1,985	1,436	0	0	0	13	13	44	0	9	285	338
Total United States	669	352	61	256	2,319,663	32,520	28,256	17	0	7	102	126	675	88	222	4,043	5,028
Total previous week	757	402	81	274	2,560,436	31,851	27,622	7	0	6	91	104	658	88	215	3,941	4,902
Total December 21, 1946	634	323	62	249	2,077,223			9	0	3	89	101	541	43	127	3,460	4,171

Service wells included: *18, †24, ‡3, §4.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity—	Signal Hill, Calif.*	Oklahoma, Kansas	Gulf Coast Tex.†	West Tex.‡
18-18.9	$1.67	....	....	....
19-19.9	1.69	....	....	....
20-20.9	1.71	$2.25	....	$2.12
21-21.9	1.73	2.27	....	2.14
22-22.9	1.77	2.29	....	2.16
23-23.9	1.80	2.31	....	2.18
24-24.9	1.84	2.33	$2.56	2.20
25-25.9	1.88	2.35	2.58	2.22
26-26.9	1.91	2.37	2.60	2.24
27-27.9	1.95	2.39	2.62	2.26
28-28.9	1.99	2.41	2.64	2.28
29-29.9	2.02	2.43	2.66	2.30
30-30.9	2.06	2.45	2.68	2.32
31-31.9	2.09	2.47	2.70	2.34
32-32.9	2.12	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

*Standard Oil Co. of California. Does not reflect recent advance made by Union Oil Co. of California. †For crude from Daboval, El Campo, and Sandy Point. ‡Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED DECEMBER 13

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	805	1,893	254	1,389	1,470	19,149	6,813	15,067	7,887
Appalachian:									
District 1	95	314	63	90	111	2,035	338	649	429
District 2	71	225	30	73	91	909	115	284	152
Ind., Ill., Ky.	826	2,939	435	937	1,127	15,886	2,594	7,875	5,026
Okla., Kans., Mo.	417	1,463	184	486	472	8,063	1,038	3,420	1,562
Inland Texas	242	985	128	130	379	2,958	637	548	642
Texas Gulf Coast	1,275	4,003	740	1,634	1,807	14,716	3,253	9,137	7,537
La. Gulf Coast	380	1,007	368	420	529	4,924	1,790	2,813	2,606
N. La., Ark.	80	214	59	63	134	1,573	355	384	209
Rocky Mountains:									
New Mexico	11	36	3	10	25	89	25	27	29
Other Rocky Mts.	146	409	33	190	276	1,801	134	871	711
California	756	2,217	188	935	2,159	15,505	1,035	13,957	26,528
Dec. 13, 1947	5,104	15,705	2,485	6,337	8,580	87,606	18,127	55,032	53,318
Dec. 6, 1947	5,269	16,051	2,113	6,525	8,749	86,968	19,273	58,241	55,556
Dec. 14, 1946	4,647	15,108	1,985	5,508	7,937	83,185	18,683	64,046	55,713

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 223,474,000 bbl. as of December 13—up 1,036,000 bbl. One year ago 226,966,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.

East Texas	$2.65	Pecos County, Texas (Yates)	1.85
Kettleman Hills, California*	2.14	Bradford, Pennsylvania	5.00
Beauregard Parish	2.60	Eastern Ill. and Western Ind.†	2.77
Illinois Basin	2.77	Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

TRENDS

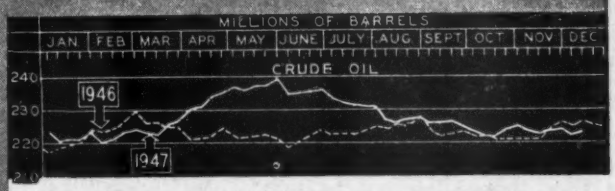
DAILY AVERAGE PRODUCTION FOR WEEK

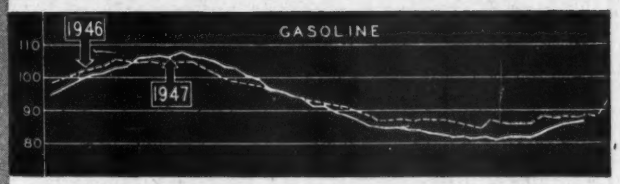
	Dec. 20 crude oil	B. of M. Dec. demand	Dec. 13 crude oil
Alabama	1,350	1,500	1,500
Arkansas	86,450	82,000	85,150
California	929,300	930,000	931,800
Colorado	48,050	47,000	48,490
Eastern	57,350	64,600	60,000
Florida	750	1,000	775
Illinois	175,100	195,000	177,000
Indiana	18,200	17,300	17,900
Kansas	290,650	306,000	259,900
Kentucky	26,700	26,000	27,100
Louisiana	465,025	446,000	465,925
North Louisiana	120,000	.....	120,900
South Louisiana	345,025	.....	345,025
Michigan	49,950	45,000	50,910
Mississippi	111,710	100,000	111,810
Montana	25,460	24,000	24,890
Nebraska	500	600	500
New Mexico	119,950	120,000	119,950
Oklahoma	411,050	405,000	411,000
Texas	2,348,600	2,300,000	2,348,600
Dist. 1 (Southwest)	24,850	.....	24,850
Dist. 2 (Southwest)	163,825	.....	163,825
Dist. 4 (Southwest)	258,000	.....	258,000
Dist. 3 (Gulf Coast)	488,000	.....	488,000
Dist. 5 (Eastern)	42,275	.....	42,275
Dist. 6 (Eastern)	119,575	.....	119,575
East Texas Field	294,000	.....	294,000
Dist. 7-C (West)	41,385	.....	41,385
Dist. 8 (West)	648,750	.....	648,750
Dist. 7-B (W. Central)	42,100	.....	42,100
Dist. 9 (N. Central)	136,625	.....	136,625
Dist. 10 (Panhandle)	89,215	.....	89,215
Wyoming	133,810	125,000	130,730
Total United States	*5,299,955	5,236,000	5,273,930
Change from prev. wk., up 26,025			

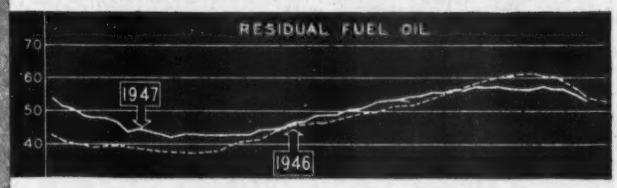
Total production January 1-December 20 †1,798,610,675 bbl.
Same period last year (crude plus cond.). 1,682,778,340 bbl.

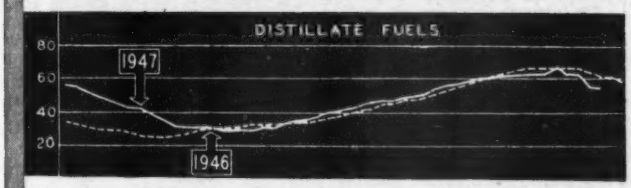
*Not incl. 45,820 bbl. condensate. †Incl. 12,216,570 bbl. condensate.

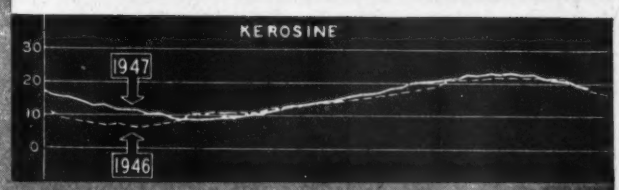
OIL STOCKS IN THE UNITED STATES



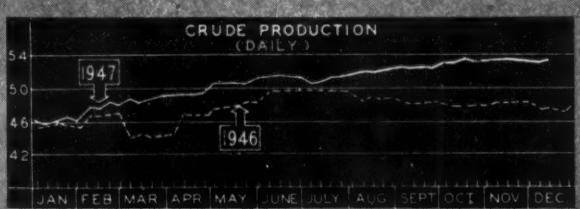


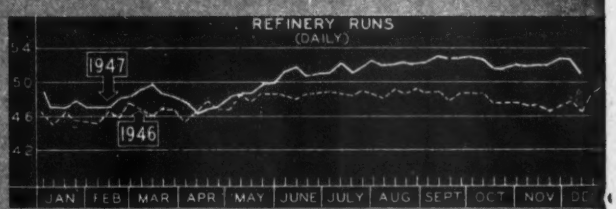




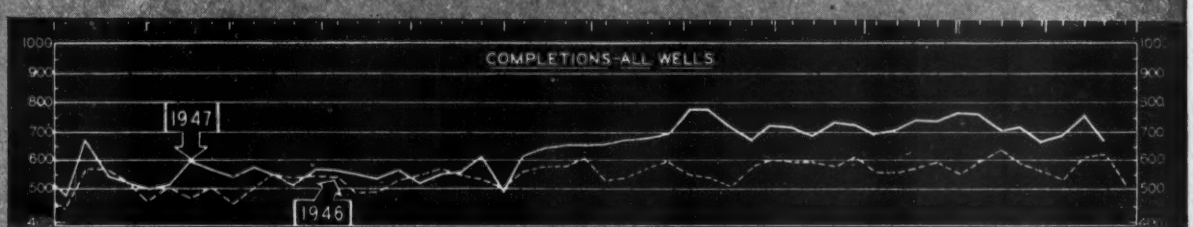


DAILY OPERATIONS

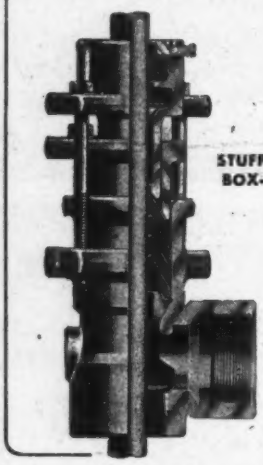




Solid line charts weekly completions, service wells in Eastern area included.



FULLY PATENTED



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MARKETS

STANDARD OIL CO. of New Jersey, considered as the reference seller in those areas where it markets but which in recent months has let other companies take the initiative, announced early this week an advance in tank-wagon prices throughout its marketing areas. Gasoline was advanced 1.1 cents per gallon; kerosine, 1.7 cents per gallon; heating oils, 1.6 cents per gallon; and heavy fuel 46 cents per barrel. The company announced that the advances were "made to reflect the recent increase in the price of crude oil."

Jersey's new quotations follow the elevation of wholesale prices by Sun Oil Co., originator of the crude-oil advance, Atlantic Refining Co., Socony-Vacuum Oil Co., Inc., and some others.

Texas Prices Up

Tank-wagon prices in Texas late last week responded to the recent 50-cent general crude-oil advance. The Texas Co. in Houston announced an increase of 1½ cents on motor fuel and 1¼ cents on kerosine and middle distillates. Gulf Refining Co. followed with a 2-cent increase on third-grade motor fuel and 1½ cents on regular premium. Gulf also has announced an advance of 5 cents a quart in both regular and premium-grade lubricants, making the new prices 35 cents and 40 cents. Three other suppliers were reported to have advanced cargo quotations on gasoline and distillates prices 1½ cents "across the board" with a 50-cent increase in residual oils. Other large suppliers were expected to announce similar boosts.

Tank-car markets on the Gulf Coast continued to be marked by a scarcity of material and extremely heavy demand, particularly for burning oils. Sales on the open market were bringing 1 cent and more above publication prices. Motor-fuel shipments were reported at around 11½ cents.

Burning-oil demand on the spot market was causing a marked reduction in the usual spread between the price for this product and that for motor fuel. Reports were that No. 6 for cargo movement was offered at $3.25 a barrel, though other shipments were at $2.50 to $2.65 a barrel.

High Premiums Offered

In the Mid-Continent area one shipper reports he is getting offers as high as 15 cents a gallon for light distillates. However, in spite of the high premiums being offered there is no great quantity of material moving and all products are exceedingly tight. One refiner who during the summer had been running about 200 cars of gasoline behind in his supply to his customers, reports he is now running about 300 cars behind, and that his gasoline output has been only slightly decreased.

One seller reported that he had sold seven cars of light distillate and indicated to the buyer that another five cars would be forthcoming. By the time the dealer obtained the cars the price had advanced ¼ cent. When the buyer was informed of this increase he promptly volunteered an advance of ½ cent explaining that even with the ¼-cent increase it was still a full cent less than what he was alredy paying for several cars at that same point.

Representative Quotations

Representative spot-market quotations of leading suppliers as of December 22, 1947 Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	10¼-11½	10.6-12* 9.6-11.1†	9-11¾
Premium gasoline, 78-80 octane	11¾-12½	10.6-13.4	9½-12½
42-44 w.w. kerosine	9½-10½	8.6-10.5	7½-11
No. 2 straw fuel oil	9⅛-10⅛	7.6-9.6	7-10
No. 6 residual	$2.30-2.65	$2.55-3.24	$1.98-2.75

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	8½	8	8¼
Grade 18-55	10.2	9.6	9.9

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	11-13¾
750 vis., No. 3-4 neutral	13-16¾
2,000 No. 5-6 neutral	14-18½

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	30-33
200 vis. No. 3 neutral, 0-10 pp.	20-21

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	47
180 vis. p.t. neutral	45

CRUDE-SCALE WAX

Mid-Continent

130-132 A.S.T.M. melting point	8½-9¼

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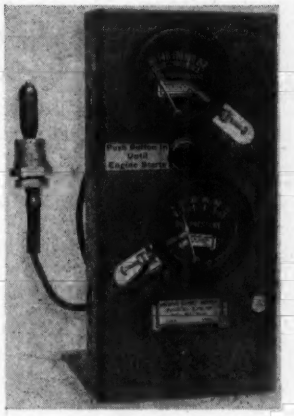

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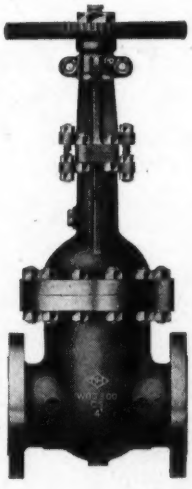

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WOODCHESTER GLOS ENGLAND

EQUIPMENT MEN ... in the News

Allan Edwards Appoints Macy

Allan Edwards, Inc., announces appointment of E. W. S. (Tim) Macy to its sales engineering staff. Macy has been associated with Stanolind Oil & Gas Co., in the production department, for the past 6½ years with the exception of 39 months in the United States Coast Guard. Macy specializes in handling pipe-line, gasoline-plant, refining, and equipment problems.

Beech Elects 1948 Officers

The annual meeting of the stockholders of Beech Aircraft Corp. was held at the company's office in Wichita recently. The following directors and officers were elected for the ensuing year: Directors—W. H. Beech, O. A. Beech, T. D. Neelands, T. A. Wells and C. G. Yankey. Officers—Walter H. Beech, president; O. A. Beech, secretary-treasurer; John P. Gaty, vice president and general manager; T. A. Wells, vice president and chief engineer; R. X. Beech, vice president in charge of procurement; Frank E. Hedrick, vice president and coordinator; and L. Winters, assistant secretary.

Bethlehem Purchases Beaumont Yard

Bethlehem Steel Co. has purchased the Beaumont, Tex., yard of Pennsylvania Shipyards, Inc., for a undisclosed consideration.

Bethlehem will operate the property as the Beaumont yard of Bethlehem Steel, according to an announcement made in Beaumont. E. C. Rechtin, formerly manager of Bethlehem's yard at San Pedro, Calif., will be manager for Bethlehem at Beaumont. Pennsylvania Shipyards, which has operated the yard since 1922, is a subsidiary of American Republics Corp., Houston.

Robinson Orifice Names Aitken

M. N. Aitken, formerly with Maintenance Engineering Corp. and Mason Nielan Regulator Co., recently has been appointed direct factory distributor in Houston for Robinson Orifice Fitting Co., Los Angeles. Aitken manufactures micro-meter runs and together with Robinson orifice fittings will make a complete meter setup.

Westcott & Greis, Inc., division of American Meter Co., will continue to represent Robinson in Houston as they have done for over 20 years.

Patterson Foundry Appoints Dilg

Earl W. Dilg has been appointed district manager of Patterson Foundry & Machine Co., East Liverpool, Ohio, with headquarters at the Cincinnati office of the company.

Dilg was formerly chief engineer and sales manager of International Engineering, Inc., Dayton. He served in the United States Air Corps as engineer in the technical engineering service, prior to that time having been general manager of Gem City Engineering Co. of Dayton.

Abele Joins Southwest Supply

W. H. ABELE

Shep Miers, Southwest Supply Co. of Pennsylvania, announces that W. H. (Bill) Abele has joined the company as district manager in charge of stores. Abele is well known in oil-equipment circles, having been Tulsa office manager for Ideco for over 3 years prior to making this new connection. Before joining Ideco, Abele was with Oilwell Supply Co. in Oklahoma City for over 5 years and has

National Geophysical Co., Inc., recently held a meeting in Dallas of the combined technical and executive staffs. The purpose of the meeting was to promote the interchange of ideas on operating and interpretational techniques. Attending the meeting were: First row—Samuel Sorkin; W. A. Walker; J. J. Shock; W. A. Reeves; Lorenz Shock; and R. R. Bartel. Second row—R. A. Bugby; C. L. Hart; W. H. Amis; H. L. Johnson; D. E. Sleeper; C. E. Macon; Dr. E. D. Alcock; J. T. Lodge, Jr.; W. B. Hogg, and W. E. Elliott. Standing—B. J. Sorrells; F. E. Leigh; E. L. Campbell; A. G. Morton; V. G. Winston, Jr.; Paul Farren; R. D. Bryan; John Appendino; W. J. Harkey; J. A. Gillin; E. L. Fetzer; R. D. Tweddell; W. R. Mitchell; R. A. Boulware; and K. H. Waters. C. E. Patton and W. H. Johnson were present at the meeting but were not included in the photograph

seen service with Link-Belt Co. and Bethlehem Supply Co. The first of Southwest Supply Co. field stores will be opened in Chickasha, Okla., on North 81 Highway.

Murray New Sales Manager

Reading Tube Corp., Reading, Pa., makers of copper tubing, announces the appointment of Joseph F. Murray to the position of sales manager. Murray was formerly associated with the Jones & Laughlin Steel Corp. in the boiler tube and oil well supplies divisions and for the past 5 years was field supervisor for the tubular sales department.

Blackmer Names Branch Sales Manager

Appointment of George A. Baldwin as manager of the Los Angeles sales office of Blackmer Pump Co. is announced.

Before joining the Blackmer organization, Baldwin was associated with the William W. Garrison advertising agency of Grand Rapids, and prior to that was advertising manager of the Insulox Division of Owens Illinois Glass Co.

Los Angeles offices of the Blackmer organization are located at 415 S. Central Avenue. Home offices of the company are in Grand Rapids.

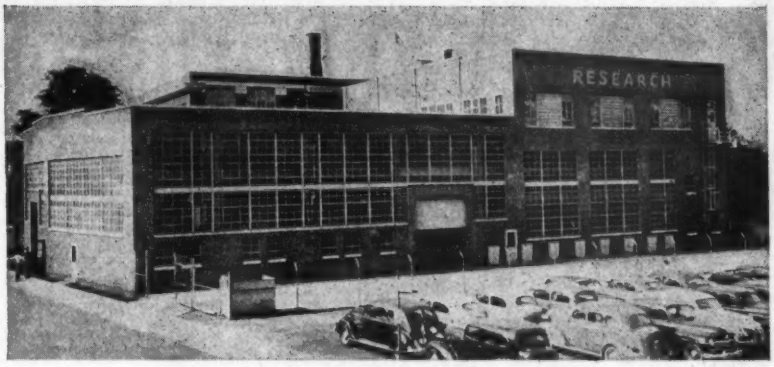
Blackmer Pump Co. also maintains direct factory sales offices at 98 Folsom Street, San Francisco, under the general management of Tom Garland.

Gar Wood Creates Regional Sales Offices

Gar Wood Industries, Inc., Wayne, Mich., announces the appointment of E. B. Hill as general sales manager and R. F. Whitworth, general service manager, and the creation of four domestic regional sales offices under Hill. Promoted to regional managers are Ross Miller, San Francisco (western region), A. C. Berg, Wayne, Mich. (central region), W. G. Barrett, Boston (northeast region), and H. C. Hatch, Washington, D. C. (southeast region).

Concurrent with the establishment of regional offices, Gar Wood Industries, Inc., has consolidated its operations into three basic divisions. Findlay Division, Findlay, Ohio, will assume the manufacture and distribution of Gar Wood tractor equipment (scrapers, bulldozers, rippers) as well as Buckeye construction machinery (shovels, ditchers, finegraders, spreaders). The Wayne Division, Wayne, will continue to manufacture and distribute Gar Wood truck equipment (hoists, bodies, winches, cranes, tanks) and the St. Paul Division, Minneapolis, will manufacture and distribute St. Paul hoists, bodies, and truck patrols.

J. D. Towne has been appointed division manager and W. S. Blakeslee was promoted to sales manager of the Wayne Division. Promotions to district manager were also announced for H. N. Nelson, B. A. Cooper, E. R. Curry, W. D. Kerrick, R. J. Palmer, R. M. Steegman, D. C. Royce and W. R. Karll. These men, in addition to the four present district managers, operate under the direction of the newly appointed regional managers and will handle all products of the company in their respective territories.



View of the recently completed research center of Jeffrey Manufacturing Co., Columbus. Modern in every respect, it is equipped to perform tests of sufficient scope to insure accurate predetermination of field results, also the construction of experimental and pilot-plant equipment. Experienced testing and development technicians and engineers supervise the performance of all laboratory work. Identified with this new research and development program are: A. W. Lemmon, manager of research and development, chain and material handling division; J. A. Flint, manager of research and development, Crusher and Traylor division; Sterling C. Moon, manager of research and development, mining division; and L. E. Newell, superintendent of research, manufacturing, and testing

Roebling's Sons Names Van Dike

VAN DIKE

John A. Roebling's Sons Co., Trenton, N. J., manufacturers of wire rope and wire products, announces the appointment of L. H. Van Dike, Jr., as Detroit, representative, replacing the late Harry T. Hirbe, who died November 24. Van Dike, a former lieutenant in the USNR, is a graduate of Dartmouth College and Tuck School of Business Administration. He has been associated with the company since 1946.

Du Pont's McCoy Retires

Retirement of J. W. McCoy as a vice president and member of the executive committee of E. I. du Pont de Nemours & Co., Wilmington, Del., was announced following a recent meeting of the board of directors. McCoy will continue to serve as a director. At the same time it was announced that William H. Ward, general manager of the company's explosives department, had been elected a director, vice president, and member of the executive committee. The changes become effective January 1.

Automatic Control Companies Merge

The merger of Robertshaw Thermostat Co., Youngwood, Pa., Fulton Sylphon Co., Knoxville, Tenn., and Bridgeport Thermostat Co., Inc., Bridgeport, Conn., under the name of Robertshaw-Fulton Controls Co. recently has been announced.

John A. Robertshaw was elected president of the new organization. J. V. Giesler, president of Fulton Sylphon Co. and Bridgeport Thermostat Co. at the time of the merger, was elected executive vice president of the new firm, in charge of the Fulton Sylphon Division, Knoxville, and Bridgeport Thermostat Division, Bridgeport. T. T. Arden was elected executive vice president in charge of Grayson Controls Division, Lynwood, Calif.

The new company, with plants at Youngwood, Knoxville, Bridgeport, St. Louis, and Lynwood, is the country's largest producer of seamless metal bellows and bellows devices, and gas and electric domestic oven and water-heater thermostats. It is also one of the largest producers of automatic temperature controls for heating, ventilating and air-conditioning, and industrial process controls.

Classified Advertising

The Market Place for the Oil Industry

UNDISPLAYED

All ads, 10 cents a word. Minimum charge, $2.00 per insertion.
Centered Line, any ad, 75 cents.
Box Numbers count 9 words when replies are to be sent to our Tulsa Office. Replies forwarded without charge.

DISPLAYED, PER INCH

$10.00 per column inch per insertion. One-point border and 12-point capitals are allowed. Larger type sizes not accepted.

All classified advertising payable in advance.
10% Discount if 3 insertions are ordered at one time.
COPY DEADLINE, 9:00 a.m. Monday prior to each week's issue.

THE OIL AND GAS JOURNAL
P. O. Box 1260, TULSA, OKLAHOMA

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FOR CABLE TOOLS
DEGEN PIPE AND SUPPLY CO.
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STEEL TUBING: 1367'—7⅝" OD x 1.313" wall x 15' long. JULIUS M. FOGELMAN, Reading, Penna.

FOR SALE

12—330 H.P. Type 10 Bessemer New 17" Power Cylinders complete ready to run with 16" to 18" Compressors. 1—230 H.P. Clark Horizontal with Compressors. Located Salem, Illinois.

ENGLE PETROLEUM, Incorporated
Box 655, Evansville, Indiana

FOR SALE
STEEL STORAGE TANK

5—74,000 Barrel, 118' x 40'
1—8,500 Barrel
5—55,000 Barrel, 117' x 29' 1"

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IRON & STEEL PRODUCTS, Inc.
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19413 S. Brainard Ave., Chicago 90, Ill.
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WE BUY and SELL

Steel Pipe and Tubing
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SONKEN-GALAMBA CORP.
2nd & Riverview, Kansas City 18, Kans.

EQUIPMENT FOR SALE

FOR SALE: At Hillsboro, Kansas. National Model 2000 core drilling rig rebuilt. Good condition. Mounted on 1944 Chevrolet truck. 36 foot mast, 4½ x 6 Gardner-Denver pump with new power end. Ben-Franklin Exploration, Inc., 303 Orpheum Building, Wichita, Kansas.

SULLIVAN "200" Rig. Mounted 1942 GMC Tandem. Thoroughly overhauled. 1200' 2⅞" Drill pipe. Complete with necessary tools. Can furnish pipe truck and water truck if desired. Lee Capshaw, 102 W. Boeing, Okla. City. Ph. 3-1292.

FOR SALE: Three 25,000 gallon horizontal tanks constructed to Aqua (patented) System. Wall thickness approximately fourtenths inch; 38 feet long by 10' 6" diameter; dished heads; lap weld construction, heavily coated, in A-1 condition. Write Box 1230, Brownsville, Texas.

FOR SALE: One 500 barrel, bolted steel tank located near McLouth, Kansas. Write Box 285 or telephone 355, Iola, Kansas.

VICTAULIC COUPLINGS

3000 6" new complete with bolts and gaskets

VICTORY SUPPLY CO.
120 N. Elgin Tulsa, Okla.

40,000 FEET WELDED STEEL PRESSURE TUBING

1.9" OD x 16 BWG x 20'9" long. ASTM Specification A-214. Tubing manufactured by Babcock & Wilcox Tube Division. Attractively priced.

WRITE P. O. BOX 45, ELYRIA, OHIO

FOR SALE

9—2,000 bbl. new, high type.
1—5,000 bbl. new.
6—10,000 bbl. new.
15—500 bbl. used, high type.
12—500 bbl. used, low type.
10—1,000 bbl. used, high type.
15—1,000 bbl. used, low type.
5—1,500 bbl. used.
4—2,000 bbl. used.
6—3,000 bbl. used.

All the above are bolted type steel tanks.

6—Used horizontal riveted and welded steel tanks, 5/16" thickness, 10' 6" in dia. x 30' long.

1—Used, heavy horizontal riveted and welded steel tank, 10'6" in diameter by 30' long, bulged heads, approximately 1" thickness throughout.

A large quantity of new, and guaranteed reconditioned steel tubing from ¾" to 6¼" OD. All is suitable for high pressure oil, gas, and gasoline lines. Every length of our used tubing will be tested for 600 lbs. hydrostatic pressure. Immediate shipment.

A. Greenspon Pipe Co., Inc.
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FRanklin 1606

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HEAVY duty kelly rig, hydraulic lift mast, 4½ x 6 G. D. pump, chain pull down, Twin Disc clutches. Drill and tank mounted on 1944 Ford trucks. Will sell or lease. Waters Drilling Service, 69 Beacon Place, Pasadena 8, Calif.

FOR SALE: One Rotary Drilling Rig, powered with gas butane engines complete with portable derrick suitable for 4500' work. Easy terms. Melton Supply Company. Box 1360, Seminole, Oklahoma.

FOR SALE—Large quantities oil well and water well casing; also line pipe, all sizes up to twenty inch. New Mexico Steel Products Company. Phone 7881. P. O. Box 2135, Wichita Falls, Texas.

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ALKYLATE FACILITIES
ENID, OKLAHOMA

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NEW PIPE AND TUBING

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170'—1½" double extra strong pipe
495'—2⅛" OD x 8.68# SS x 30'
30,000'—2.5" OD x 2.8# x 20'
4,500'—2⅞" OD (2½") x 5.5# x 20'
315'—2⅞" OD (2½") x 7.66# x 20' RL
388'—3⅜" OD x 15.35# x 20'
1,000'—4" OD x 7# x 18' RL
392'—4½" OD x 10.35# x 8'-10'
56'—4" double extra strong pipe
280'—5⅝" OD x 10# x 20'

HORWITZ PIPE & STEEL CO.
415 S. Western Oklahoma City, Okla.

NEW STEEL TANKS

API Bolted, Complete
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10—1,000 barrel Tank
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